LAMELLIBRANCHIA.

Family NUCULANIDÆ.

Genus NUCULANA, Link.

Nuculana, sp.

Plate XXXIII., fig. 13.

Three small specimens of *Nuculana* belonging to the same type as *N. lineata* (Sowerby), and *N. Försteri* (Müller) were obtained by Professor Gottsche from the matrix collected by Griesbach. The shell is oval, slightly inequilateral, with the posterior end pointed, and the anterior margin rounded. The entire surface, except near the postero-dorsal margin, is covered with strong, regular, concentric ribs. The length is 5 mm.

Family ARCIDÆ.

Genus ARCA, Linnæus.

Arca, sp.

A single specimen of a right valve belonging to the Hamburg Museum, is referable to *Arca* (restricted), but is too imperfect for specific description.

Genus BARBATIA, Gray.

Barbatia meridiana, sp. nov.

Plate XXXIII., fig. 14.

Description.—Shell sub-quadrate, rounded, higher posteriorly than anteriorly, moderately inequilateral, of small convexity. Anterior margin rounded, forming an obtuse angle with the hinge-line. Ventral margin slightly convex, sloping posteriorly. Posterior margin oblique, sinuous, forming an obtuse angle with the hinge-line. Postero-ventral extremity rounded. Umbones rather small, incurved, situated a little in front of the middle of the hinge-area. No carina. The region behind a line drawn from the umbo to the postero-ventral extremity is compressed and divided into two parts by a median radial furrow. Hinge-area narrow, rather longer than half the greatest length of the valve.

Ornamentation consists of numerous narrow, slightly raised ribs separated by linear grooves. On the postero-dorsal region the ribs become larger and more prominent. Concentric growth-lines, or lamellæ, occur and become more distinct on the postero-dorsal region.

Length 21 mm.; height, 14 mm.

Affinities.—This species, of which I have seen a single left valve only, appears to be distinct from other Cretaceous forms of *Barbatia*. It presents a slight resemblance to the Aachen species figured by Holzapfel * as *Arca* cf. *Gallienei*, d'Orbigny, but is less convex, and has the posterior margin more oblique, and the ornamentation on the posterior area more strongly developed.

BARBATIA, sp.

A single imperfect left valve resembles the last species, but is much larger and has a much more distinct ridge passing from the umbo to the postero-ventral extremity.

Length about 100 mm.; height 50 mm.

GENUS TRIGONOARCA, Conrad.

TRIGONOARCA CAPENSIS (Griesbach).

Plate XXXIV., figs. 1, 2.

1871. *Arca capensis*, Griesbach, Q.J.G.S. xxvii., p. 66, pl. iii., fig. 10.

Description.—Shell stout, quadrate or sub-trapezoidal, moderately convex; length a little greater than height, but sometimes nearly equal. Anterior margin slightly or moderately convex, forming an angle with the dorsal margin and curving regularly at the antero-ventral margin. Ventral margin slightly curved or almost straight, placed a little obliquely. Posterior margin slightly convex, oblique, forming an acute angle with the ventral margin and an obtuse angle with the hinge-margin. Umbones of moderate size, incurved, nearly median, but behind the middle of the hinge-area. Carina rounded; the part of the valve behind it flattened but slightly convex and sloping very rapidly to the posterior margin. Hinge-area long, depressed, with its antero-dorsal margin raised, and with four ligament grooves.

Ornamentation inconspicuous, consisting of numerous slightly raised radial ribs which are somewhat wavy and separated by narrow,

* Mollusk. Aachen. Kreide (1889), p. 204, pl. xxii., fig. 7.

shallow grooves. Numerous growth-lines cross the ribs and grooves. On the posterior area the ornamentation is less distinct, and on its dorsal part the ribs are narrower and the interspaces wider. Internal margins of valves smooth.

Length	60·5	.	57	.	44	. 43 mm.
Height	58	.	51	.	41	. 39 ,,

Affinities.—This species, as mentioned by Griesbach, is allied to *Trigonoarca trichinopolitensis* (Forbes).* It differs, however, in having the umbones distinctly behind the middle of the hinge-area, in the posterior part of the shell being relatively shorter, and in the less rounded character of the anterior margin (especially its dorsal part.) The ornamentation appears to be less developed than in *T. trichinopolitensis*, but that may possibly be due to difference of preservation.

Trigonoarca umzambaniensis (Baily)† may be identical with *T. capensis*, but unfortunately the type is missing, and Baily's figure is not sufficient to permit a definite opinion.

Remarks.—Twelve specimens, including the type which is in the Hamburg Museum, have been seen.

Genus NEMODON, Conrad.‡

Nemodon natalensis (Baily).

Plate XXXIV., figs. 3–7.

1855. *Area natalensis*, Baily, Q.J.G.S., xi., p. 461, pl. xiii., fig. 2.
1904. *Latiarca* (?) *natalensis*, Etheridge, Second Rep. Geol. Surv. Natal and Zululand, p. 77, pl. i., figs. 10–12.

Description.—Shell stout, sub-quadrate, inflated, inequilateral. Anterior margin curving and passing gradually into the slightly curved ventral margin, and forming with the hinge-line an angle which is rather larger than a right angle. Posterior margin oblique, nearly straight or slightly convex or sinuous, and forming with the

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 150, pl. xv., fig. 16. Stoliczka, Cret. Fauna S. India, vol. iii. (1871), p. 353, pl. xviii., figs. 12, 14, pl. xix., figs. 2, 3, pl. xx., pl. 2, 8, 9, 10.

† Q.J.G.S., xi. (1855), p. 460, pl. xiii., fig. 1. Etheridge, Second Rep. Geol. Survey Natal and Zululand (1904), p. 76, pl. i, figs. 1–5.

‡ Amer. Journ. Conch. vol. v. (1869), p. 97; Kerr's Rep. Geol. Survey, N. Carolina, vol. i. (1875), Appendix A, p. 3. Meek, Invert. Cret. and Tert. U. Missouri (1876), p. 81.

ventral margin an acute but well-rounded angle, and with the hinge-line an obtuse angle. Umbones large, incurved, pointed, with a well-rounded carina extending to the postero-ventral extremity and cutting off a steeply-sloping and flattened area which has a radial furrow near its posterior third and a radial rib near its anterior third. Hinge-line less than the greatest length of the valve. Hinge-area broad, usually with from four to six ligament grooves.

Ornamentation of the left valve consists of strong radial ribs separated by flattened interspaces of greater breadth than the ribs. Both ribs and interspaces are crossed by fine, fairly regular growth-lines, and at distant intervals by a few growth-furrows. Near the anterior end the ribs become rather smaller, and posteriorly they may become rather closer together. In the interspaces there are sometimes a few fine radial ribs. At a short distance in front of the carina the ornamentation changes suddenly—the strong ribs being replaced by much finer ribs separated by linear furrows. This kind of ornamentation is continued on to the posterior area, but becomes rather finer and may be indistinct on its posterior portion.

On the right valve the radial ribs are broader than those on the left, and are separated by narrow furrows; the ribs may be absent or indistinct near the anterior extremity, and continue with little or no change to the carina. In well-preserved specimens the ribs bear numerous transverse ridges. On the posterior area the ornamentation is much finer than on the rest of the valve.

The lateral teeth are long and parallel or nearly parallel with the hinge-margin, and bear rather irregular transverse ridges. There are a few small, transverse median teeth. Margins of valves coarsely crenulate.

Length of hinge	27	.	25	.	24	. 14 mm.
Height of valve	28	.	27	.	26	. 13 ,,

Affinities.—This species resembles *Arca japetica* Forbes,* from the Ariyalúr, the Valudayúr, and *Trigonoarca* Beds, but in the latter the ventral margin has a greater curvature, the posterior extremity is more rounded, the ribs on the left valve are more widely separated, and the shell is relatively longer.

The examples from Saghalien referred to *Macrodon japeticum* (?) by Schmidt † and those of *Cucullæa sachalinensis* of the same

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 148, pl. xvi., fig. 2. Stoliczka, Cret. Fauna S. India, vol. iii. (1871), p. 350, pl. xviii., figs. 6–11.

† Petrefakt. Kreideformat. Insel. Sachalin. Mém. Acad. Imp. Sci. St. Petersb., ser. 7, vol. xix., No. 3 (1873), p. 25, pl. v., fig. 5, pl. viii., fig. 8.

author,* may perhaps be related to *N. natalensis*, but the specimens figured are not sufficiently perfect for comparison.

This species is referred by Etheridge to the genus *Latiarca*, but it differs from that in the absence of a raised margin to the posterior adductor impression, and in being more nearly equilateral; also the anterior teeth are relatively shorter and the posterior teeth longer. It differs from *Grammatodon* in having the anterior teeth nearly parallel to the hinge margin and the posterior teeth relatively shorter; in these characters it agrees with *Nemodon*.

Remarks.—Twenty-one left valves, five right valves, and one specimen with the valves united have been seen. The type is in the British Museum.

Genus PECTUNCULUS, Lamarck.

Pectunculus africanus, Griesbach.

Plate XXXIV., figs. 8–12.

1871. *Pectunculus africanus*, Griesbach, Q.J.G.S. xxvii., p. 66, pl. iii., fig. 8.

Description.—Shell rather small, more or less sub-quadrate but rounded; somewhat higher than long, the greatest length being below the middle of the valve; only slightly inequilateral, moderately convex, with the postero-dorsal part compressed. Anterior margin rounded. Dorsal part of posterior margin more or less truncate and sometimes forming an obtuse angle with the part below which curves and passes gradually into the ventral margin. Umbones small, inconspicuous, only slightly curved. Hinge-line long, curving considerably. In young specimens the outline of the shell is more orbicular, the length and height are equal or nearly equal, and the greatest length is at the middle of the valve.

Ornamentation consists of numerous narrow, only slightly raised radial ribs, separated by linear grooves. On the posterior half of the valve the ornamentation is rather more distinct than on the anterior half owing to some of the ribs being rather more prominent. Between the prominent ribs one or two smaller ribs occur. Internal margins of valves coarsely crenulate.

Length	22	.	20	.	18·5	.	14	.	12 mm.
Height	23	.	21	.	20	.	14	.	13 ,,

Affinities.—This species presents some resemblance to *P. subauri-*

* Petrefakt. Kreideformat. Insel. Sachalin. Mém. Acad. Imp. Sci. St. Pétersb., ser. 7, vol. xix., No. 3 (1873), p. 24, pl. v., fig. 6, pl. viii., figs. 6, 7.

culatus, Forbes,* from the Ariyalúr Group, but is relatively shorter, less rounded in outline, with the hinge-line more strongly curved and the lateral teeth more oblique. The ornamentation also appears to be somewhat different.

Remarks.—Forty specimens of this species have been seen. The type is in the Hamburg Museum.

Family TRIGONIIDÆ.

Genus TRIGONIA, Bruguière.

Trigonia Shepstonei, Griesbach.

Plate XXXV., figs. 1, 2.

1871. *Trigonia Shepstonei*, Griesbach, Q.J.G.S., xxvii., p. 66, pl. iii., fig. 11.

Description.—Shell subtrigonal, very inequilateral, produced posteriorly; length greater than height. Valves inflated anteriorly, gradually compressed posteriorly. Anterior margin rounded, forming a regular curve which passes gradually into the ventral margin. The posterior part of the ventral margin slopes upwards to join the short, oblique posterior margin. Postero-dorsal margin long, concave. Umbones of moderate size, incurved, situated at a distance from the anterior end equal to about a quarter of the entire length of the shell. Area moderately large, flattened, somewhat truncated posteriorly, with a longitudinal furrow near the middle. There is a narrow carina near the umbo, but it becomes indistinct posteriorly. Escutcheon large, excavated.

Ornamentation consists of from 17 to 19 strong, slightly curved costæ, which are separated by rounded interspaces of much greater breadth than themselves. The costæ bear short, stout, erect spines. Fine ridges cross both costæ and interspaces. Near the umbo the costæ are concentric, but in the middle of the valve they run in a dorso-ventral direction. They cut the anterior margin obliquely, and are nearly perpendicular to the middle part of the ventral margin; towards the posterior extremity they slope posteriorly. On the anterior part of the area there are transverse costellæ; in passing posteriorly the costellæ become more oblique and less distinct. The

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 150, pl. xvii., fig. 13. Stoliczka, Cret. Fauna S. India, vol. iii. (1871), p. 349, pl. xvii., figs. 31, 32.

posterior part of the area is nearly smooth except for growth-lines. The whole of the escutcheon bears transverse costellæ.

Length	53	. 43	.	35 mm.
Height	43	. 32	.	29 ,,

Affinities.—*T. Shepstonei* shows some resemblance to the Indian forms of *T. scabra*, Lamarck, figured by Stoliczka,* but is readily distinguished by its area, by the finer costellæ on the escutcheon, and by the fewer and more spiny tubercles on the costæ.

The area and escutcheon in *T. Shepstonei* resemble those of *T. crenulata*, Lamarck,† but in the former the costæ are less numerous and bear fewer tubercles, and the anterior costæ cut the front margin more obliquely.

Remarks.—Griesbach's Fig. 11*a* does not give a correct impression of the characters of this species. The costæ are much more prominent, and the concentric arrangement of the tubercles is much less distinct than they appear in that figure. The posterior part of the valve is also incorrectly drawn; the area is really much larger and the posterior costæ smaller and more oblique.

The originals of Griesbach's Figs. 11, 11*b*, and 11*c* are in the Hamburg Museum. The original of Fig. 11*a* appears to be missing, but a note with the Hamburg specimens states that "probably the figure is constructed from several specimens." In the original of Fig. 11 the valves are gaping, so that the shell is not quite so convex as appears at first sight from the figure.

Fifteen specimens have been examined.

Trigonia elegans, Baily.

Plate XXXV., figs. 3, 4.

1855. *Trigonia elegans*, Baily, Q.J.G.S., xi., p. 461, pl. xiii., fig. 3.

Description.—Shell ovately trigonal, somewhat produced posteriorly, moderately convex with flattened sides. Greatest convexity is along a line drawn from the umbo ventrally. Anterior marginal part of the valve curves rapidly and becomes vertical to the plane between the valves, or is sometimes even bent inwards. This curvature decreases in passing along the ventral margin in a posterior direction. The whole of the margin of the valve anterior to the umbo forms a regular and considerable curve and passes gradually into the ventral margin, the curvature of which decreases

* Cret. Fauna S. India (1871), p. 314, pl. xv., figs. 24–26, pl. xvi., figs. 35–40.

† For references see Woods, Mon. Cret. Lamell. England, vol. i. (1900), p. 82.

posteriorly. Posterior margin rather short, slightly oblique. Postero-dorsal margin long, slightly concave. Umbones inconspicuous, recurved, situated at a distance from the anterior end equal to a third or more of the total length of the valve. Area rather broad, flattened, with a gentle dorsal slope, and divided near its middle by a shallow furrow. Near the umbo there is a narrow carina, but posteriorly it is absent or indistinct. Escutcheon rather small, sloping gradually in the neighbourhood of the umbo, but more rapidly behind.

Sides of valves ornamented with from 17 to 20 narrow, tuberculate costæ separated by broad, shallow interspaces. Near the umbo the costæ form a large curve and are very oblique to the margin of the area, but in passing posteriorly the curvature decreases and they become less oblique to the area. Near the umbo the costæ are continued on to the area, but the larger part of the area is almost smooth except for fine growth-ridges. On the escutcheon there are narrow costellæ with broad interspaces. In young specimens numerous fine, concentric, linear ridges run obliquely across the costæ and interspaces.

Length	32	.	27	. 20 mm.
Height	28	.	23	. 17 „

Affinities.—*T. elegans* does not appear to be closely allied to any other species. It shows a slight resemblance to *T. Meyeri*, Lycett,* but differs from it in several respects.

Remark.—The type is in the Museum of the Geological Society of London.

Family MYTILIDÆ.

Genus MYTILUS, Linnæus.

Plate XXXV., fig. 5.

A single imperfect specimen of a left valve of *Mytilus* or some closely allied form is in the Griesbach collection belonging to the Hamburg Museum.

Genus MODIOLA, Lamarck.

Modiola kaffraria, sp. nov.

Plate XXXV., fig. 6.

Description.—Shell ovate-oblong, very convex, with rounded extremities. Ventral margin nearly straight; the opposite margin

* Brit. Foss. Trigoniæ (1875), p. 125, pl. xxiii., fig. 6, pl. xli., figs. 15, 16.

moderately convex, so that the height of the valve is rather greater at or near the posterior end of the hinge-line than elsewhere. Valves divided into two parts by a rounded ridge extending from the umbo to the postero-ventral extremity. The ventral part is flattened or slightly concave and slopes rapidly to the ventral margin. The dorsal part is rather larger than the ventral part; it is convex and slopes gradually to the postero-dorsal margin. Umbones obtuse, incurved. Surface of valves smooth except for growth-lines.

Length 25 mm.; height 10 mm.

Affinities.—This species does not seem to be closely related to any known form. *M. araucana* (d'Orbigny),* from the Quiriquina Beds, although similar in some respects is easily distinguished by the curvature of the ventral margin.

M. Dieneri, Böhm,† is more curved, especially on the dorsal side, and the anterior extremity is more rounded.

Family PECTINIDÆ.

Genus PECTEN, Müller.

Sub-genus CHLAMYS, Bolten.

Pecten (Chlamys) amapondensis, Griesbach.

Plate XXXV., figs. 7–9.

1871. *Pecten amapondensis*, Griesbach, Q.J.G.S., xxvii., p. 66, pl. iii., fig. 7.

Description.—Shell small, ovate, pointed dorsally, slightly inequilateral, a little higher than long, antero- and postero-dorsal margins nearly straight, the remaining margin forming a regular curve. Apical angle about 95°. Right valve moderately convex with from 11 to 15 radial ribs. On the dorsal part of the valve these ribs are strong and separated by deep furrows; ventrally they become broader and less prominent, and are separated by shallow interspaces. Towards the anterior and posterior margins also the ribs are less distinct than on the middle of the valve. In the furrows on the dorsal part of the valve fine, rather irregular, radial striæ occur. Numerous fairly regular concentric lamellæ are present; but appear to be absent near the umbo, and are closer together on the ventral than on the more dorsal parts of the valve. Anterior ear rather

* Wilckens, Neues Jahrb. für Min., &c., Beil. Band xviii. (1904), p. 227, pl. xix., fig. 4.

† Zeitschr. d. deutsch. geol. Gesellsch., vol. lii. (1900), p. 218, pl. vii., fig. 12.

large, with a small sinus; ornamented with a few radial ribs crossed by concentric ridges. Posterior ear rather smaller, triangular, with its outer angle obtuse, and with a few radial ribs crossed by growth-ridges. On the left valve the ribs are much narrower than the furrows.

Length	20	.	19	.	14·5	.	13 mm.
Height	22	.	21	.	16	.	14 ,,

Affinities.—*P.* (*Chlamys*) *amapondensis* does not appear to be closely related to any known species. The ornamentation shows some resemblance to that of *P. carlottensis*, Whiteaves,* from the Queen Charlotte Islands, but the ribs are less numerous, and the shell is more ovate in outline.

Remarks.—The type is in the Hamburg Museum. Twelve right valves and two imperfect left valves have been seen.

Pecten (Chlamys) capensis, sp. nov.

Plate XXXV., fig. 10.

Description.—Left valve ovate, slightly inequilateral, rather higher than long, moderately convex. Antero- and postero-dorsal margins of moderate length; the remaining margins forming a regular curve. Apical angle about 95°.

Ornamentation consists of 24 moderately broad, flattened ribs, which are straight or slightly undulating and ornamented with transverse projections at intervals. On some parts of the valve the ribs are of two sizes, alternately larger and smaller—the former starting from the umbo, the latter at some distance from it. Near the anterior and posterior margins the ribs become rather smaller. The interspaces are broad and flattened, and appear to have been, when perfectly preserved, marked with radial striæ, which curved outwards on the anterior and posterior parts.

Ears rather large, attached to almost the whole of the antero- and postero-dorsal margins. Posterior ear rather smaller than the anterior, with its outer angle obtuse.

Length 20 mm.; height 24 mm.

Affinities.—In the general character of its ornamentation this species presents some resemblance to some forms of *P. Robinaldinus*, d'Orbigny, but the height of the shell is relatively less. *P.* (*Chlamys*) *capensis* also resembles *P. granulatus*, d'Orbigny,†

* Mesozoic Fossils (Geol. Survey of Canada), vol. i., part 3 (1884), p. 251, pl. xxxiii., fig. 7.

† Voyage au Pol Sud, &c. (1847), pl. v., figs. 29, 30.

but in the latter the height and length are equal, the apical angle is larger, the ribs are larger and more distinctly of different sizes.

Remark.—This species is at present known by a single left valve.

Section ÆQUIPECTEN, Fischer.

Pecten (Æquipecten) Kossmati, sp. nov.

Plate XXXV., fig. 11.

Description.—Left valve ovate, almost equilateral, slightly higher than long, of very small convexity. Antero- and postero-dorsal margins rather long, nearly equal, almost straight; the remaining margins form a regular curve. Apical angle about 95°.

Ornamentation consists of 16 strong, narrow, straight radial ribs which are sharply limited and have rounded summits with scaly or lappet-like projections. Near the anterior and posterior margins the ribs are rather closer together. The interspaces are flat, and much broader than the ribs, and are ornamented with fine but somewhat irregular striæ; on the median part of the valve these striæ are parallel with the ribs, but on the anterior and posterior parts they curve outwards and cut the ribs obliquely.

Anterior ear large, with its outer angle rectangular, ornamented with two or three strong radial ribs and with growth-lines. Posterior ear smaller than the anterior, with its outer angle obtuse, ornamented with a few radial ribs having scaly projections.

Left valve not seen.

Length 18·5 mm.; height 20 mm.

Affinities.—This species resembles *P. acute-plicatus*, Alth,* from the Senonian of Lemberg (Galicia), but differs in having broader and flatter interspaces with radial striæ, and in having a smaller apical angle and larger ears.

Sub-genus CAMPTONECTES, Meek.

Pecten (Camptonectes) sp.

Plate XXXV., figs. 12, 13.

Description.—Right valve ovate, slightly inequilateral, with the dorsal third pointed, and the margin of the remaining part forming

* Geogn.-palæont. Beschreib. v. Lemberg (Haidinger's Naturwiss. Abhandl., vol. iii., pt. 2, 1850), p. 248, pl. xii., fig. 34. Kner, Kreidverstein. v. Ost-Galizien (Denkschr. d. k. Akad. Wissensch. Wien, Math.-nat. Cl., vol. iii., 1852). p. 316, pl. xvii., fig. 1. E. Favre, Moll. Foss. Craie de Lemberg (1869), p. 148, pl. xiii., figs. 3, 4.

a regular curve. Antero-dorsal margin rather longer than the postero-dorsal.

Ornamentation consists of numerous fine radial furrows. Near the median part of the valve the furrows are nearly straight and often discontinuous; they are separated by broad, flat interspaces on which fine concentric lines may occur. On the anterior and posterior parts of the valve the furrows become more curved, deeper, and more continuous, and the interspaces become narrower, more raised, and rib-like. The furrows do not show punctæ.

Anterior ear large, with its anterior margin nearly at right angles to the hinge-line, ornamented with fine ridges parallel with the anterior margin; byssal sinus of moderate size. Posterior ear smaller than the anterior, with its outer angle obtuse, ornamented with fine radial ribs and growth-ridges.

Left valve with ornamentation similar to, but rather coarser than, that on the right valve. Anterior ear large with its outer angle nearly rectangular. Posterior ear smaller than the anterior, with its outer angle obtuse.

Length 17 mm.; height 19 mm.

Affinities.—This belongs to the same type as *P. virgatus*, Nilsson,* but appears to differ from the Swedish form in its finer ornamentation. In that respect it differs also from the forms from the Ariyalúr and Trichinopoli Groups figured by Stoliczka† as *P. curvatus*, Geinitz. The Pondoland form appears to approach most nearly the example from Texas figured by Römer‡ as *P. virgatus*.

Sub-genus NEITHEA, Drouet.

Pecten (Neithea) quinquecostatus, Sowerby.§

Plate XXXV., fig. 14.

Several examples of this widely distributed species have been found, and seem to agree in every respect with European specimens. They are perfectly preserved and show clearly the fine, regular concentric ridges.‖ In some cases the small transverse denticles are present in the hinge of the right valve.

* Petrific. Suecana (1827), p. 22, pl. ix., fig. 15. Hennig, Revision Lamell. i. Nilsson's Petrific. Suecana (1897), p. 41, pl. ii., figs. 28, 33; pl. iii., figs. 32, 33.

† Cret. Fauna S. India (1871), p. 433, pl. xxxi., figs. 15, 16; pl. xli., figs. 4–6.

‡ Kreidebild. v. Texas (1852), p. 66, pl. viii., fig. 5.

§ For synonymy see Woods, Mon. Cret. Lamell. England, vol. i. (1903), p. 202.

‖ Woods, ibid., pl. xl., figs. 1, 2*c*, 4*b*.

Family OSTREIDÆ.

Plate XXXV., fig. 15–17.

A few examples of small forms of *Ostrea* and *Exogyra** are present in the Survey collection, but they are insufficient for specific determination.

Family PERNIDÆ.

Genus INOCERAMUS, Sowerby.

Inoceramus expansus, Baily.

1855. *Inoceramus expansus*, Baily, Q.J.G.S., xi., p. 462, pl. xiii., fig. 5.

1871. *Inoceramus expansus*, Stoliczka, Cret. Fauna S. India, p. 401 (No. 180).

Non 1863. *Inoceramus expansus*, Schafhäutl, Sud-Bayerns Lethæa Geognostica, p. 153, pl. xxxiv., figs. 1, 2, 6.

Description.—Shell very large, very inequilateral, longer than high; moderately convex near the umbones, flattened elsewhere, with a steep slope near the anterior margin. Umbones moderately prominent, curving anteriorly.

Surface with numerous narrow concentric ribs, separated by shallow rounded interspaces. The ribs curve rather rapidly in passing on to the postero-dorsal part of the shell, and cut the posterior part of the dorsal margin obliquely.

Remarks.—This species attains a very large size. An imperfect specimen belonging to the Survey was at least 180 mm. in height. Captain Garden estimated that some of the specimens which he saw *in situ* must have been nearly 3 feet in height.

The type of *I. expansus* consists of the dorsal portion of a left valve detached from the matrix. It is preserved in the Museum of the Geological Society of London.

I. expansus appears to be allied to *I. Cripsi*, Mantell,† but more numerous and more perfect specimens are needed before a satisfactory comparison can be made. Forms either identical with or allied to *I. Cripsi* have been described from many European

* For a discussion of the systematic value of the "genera" *Ostrea*, *Exogyra*, *Gryphea*, *Alectryonia*, &c., see Peron, Explor. Scient. Tunisie, Descript. Brach. etc. Terr. Cret. de la Tunisie (1893), pp. 107–9.

† Foss. S. Downs (1822), p. 133, pl. xxvii., fig. 11.

localities,* as well as from Northern Africa,† Southern India,‡ Australia,§ America,‖ &c. Some of the examples from Gosau figured by Zittel closely resemble *I. expansus*.

Family ASTARTIDÆ.

Genus ASTARTE, Sowerby.

Astarte Griesbachi, sp. nov.

Plate XXXV., figs. 18, 19.

1871. *Astarte*, sp., Griesbach, Q.J.G.S., xxvii., p. 67, pl. iii., fig. 9.

Description.—Shell small, moderately convex, subquadrate, slightly longer than high, moderately inequilateral. Antero-dorsal margin concave. Anterior and ventral margins rounded. Postero-dorsal margin slightly convex, forming an obtuse angle with the slightly curved posterior margin. Umbones pointed. Lunule smooth, rather large, sharply limited. Escutcheon smooth, deep, long.

Ornamentation consists of from 7 to 10 prominent, stout, concentric ribs which curve rather sharply on the postero-dorsal part of the valve. The ribs are separated by rounded furrows broader than themselves. A few fine ribs are present on the main ribs and in the furrows. Margin of valve crenulated.

Length	7·75	.	5 mm.
Height	7	.	4·5 ,,

Affinities.—This species belongs to the same type as *Astarte similis*, Goldfuss.¶ It resembles *Gouldia trigonoides*, Stoliczka.** but is less elongate and not so narrow posteriorly; also the ribs appear to be closer together.

A. subnumismalis, Thomas and Peron,†† from the Santonian of

* Zittel, Bivalven d. Gosaugeb., pt. 2 (1866), p. 19, pl. xiv., figs. 1–5; pl. xv., figs. 1–5. Geinitz, Das. Elbthalgeb. in Sachsen, pt. 2 (1872), p. 49, pl. xiii., figs. 11–15. Schlüter, Zur Gattung *Inoceramus* (Palæontographica, vol. xxiv. 1877), p. 277.

† Peron, Brach. etc. Terr. Crét. de la Tunisie (1893), p. 242.

‡ Stoliczka, Cret. Fauna S. India (1871), p. 405, pl. xxvii., figs. 1–3; pl. xxviii., fig. 2.

§ Etheridge, Cret. Invert. Fauna N.S. Wales (1902), p. 70.

‖ Römer, Kreidebild. v. Texas (1852), p. 56, pl. vii., fig. 2.

¶ Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, xxxv., 1889), p. 194, pl. xix., figs. 11–15.

** Cret. Fauna S. India (1871), p. 290, pl. x., figs. 4–8.

†† Explor. Scient. Tunisie, Descript. Brach. etc. des Terr. Crét. (1893), p. 268, pl. xxviii., figs. 7, 8.

Tunis, appears to be more nearly equilateral, and more rounded posteriorly than *A. Griesbachi.*

Remarks.—The specimen figured by Griesbach as *Astarte*, sp., is a portion of a left valve, and is now in the Hamburg Museum. Eight examples of this species have been examined.

Sub-genus ERIPHYLA, Gabb.

Astarte (Eriphyla) lenticularis (Goldfuss).

Plate XXXV., figs. 20.

1840. *Lucina lenticularis*, Goldfuss, Petref. Germ. vol. ii., p. 228, pl. cxlvi., fig. 16.
1840. *Lucina Reichii*, Geinitz, Char. d. Schicht. u. Petref. des sächs. Kreidegeb., pt. 2, p. 49, pl. xvi., fig. 7.
1841. *Lucina Reichii*, Römer, Die Verstein. d. nord-deutsch. Kreidegeb., p. 73, pl. ix., fig. 15.
1841. *Lucina ? lens*, Römer, Ibid., p. 73, pl. ix., fig. 14.
1843. *Lucina lenticularis*, Geinitz. Die Verstein. von Kieslingswalda, p. 13, pl. ii., fig. 4.
1846. *Lucina lenticularis*, Reuss, Die Verstein. der böhm. Kreideformat., pt. 2, p. 4, pl. xxxiii., figs. 20–24; pl. xxxvii., fig. 17, pl. xli., fig. 10.
1850. *Lucina lenticularis*, d'Orbigny, Prodr. de Pal., ii., p. 241.
1850. *Lucina lenticularis*, Geinitz, Das Quadersandst. oder Kreidegeb. in Deutschland, p. 158.
1860. *Artemis lenticularis*, Bosquet in Staring's Natuur. Hist. van Nederland. De Bodem van Nederland, ii., p. 380.
1863. *Lucina lenticularis*, Drescher, Zeitschr. d. deutsch. geol. Gesellsch., vol. xv., p. 348.
1870. *Eriphyla lenticularis*, Stoliczka, Cret. Fauna S. India, vol. iii., p. 181, pl. vi., figs. 7–13.
1872. *Eriphyla lenticularis*, Geinitz, Das Elbthalgeb. in Sachsen (Palæontographica, vol. xx., pt. 2), p. 62, pl. xvii., figs. 1, 2; pl. xviii., figs. 1, 2.
1876. *Eriphyla lenticularis*, Brauns, Zeitschr. f. d. gesammt. Naturwiss. vol. xlvi., p. 367.
1877. *Eriphyla lenticularis*, Fritsch, Stud. im Gebiete der böhm. Kreideformat. ii., Weissenberg. u. Malnitz. Schicht. p. 116, fig. 78.
1883. *Eriphyla lenticularis*, Fritsch, Ibid., iii., Iserschicht. p. 101.

1884. *Eriphyla lenticularis*, Holzapfel, Zeitschr. d. deutsch. geol. Gesellsch., vol. xxxvi., p. 458, pl. vi., figs. 1, 2.
1885. *Dozyia lenticularis*, J. Böhm, Verhandl. d. nat. Verein. d. preussisch. Rheinl., vol. xlii., p. 126.
1888. *Astarte* (*Eriphyla*) *lenticularis*, G. Müller, Jahrb. d. k. preussisch. geol. Landesanst. für 1887, p. 424.
1889. *Eriphyla lenticularis*, Fritsch, Stud. im Gebiete der böhm. Kreideformat. iv. Teplitzer Schicht. p. 78.
1889. *Eriphyla lenticularis*, Holzapfel, Die Mollusk. Aachen. Kreide (Palæontographica, vol. xxxv.), p. 195, pl. xiv., figs. 5–7.
1891. *Lucina lenticularis*, Langenhahn and Grundy, Das Kieslingswalder Gestein und seine Versteinerungen, p. 11, pl. iii., fig. 21.
1893. *Eriphyla lenticularis*, Fritsch, Stud. im Gebiete der böhm. Kreideformat. v. Priesener Schicht., p. 91.
1894. *Eriphyla lenticularis*, Lundgren, Mollusk-faunan i Mamillatus och Mucronata zonerna (K. Svenska Vet.-Akad. Handl., N. F. xxvi., No. 6), p. 48.
1897. *Eriphyla lenticularis*, Fritsch, Stud. im Gebiete der böhm. Kriedeformat. vi., Chlomek. Schicht., p. 55.
1898. *Eriphyla lenticularis*, G. Müller, Mollusk. d. Untersenon v. Braunschweig u. Ilsede, p. 56, pl. viii., fig. 3.
1900. *Eriphyla lenticularis*, Gagel and Kaunhowan, Jahrb. d. k. preussisch. geol. Landesanst. für 1899, p. 232.
1901. *Eriphyla lenticularis*, Sturm, Jahrb. d. k. preussisch. geol. Landesanst. für 1900, vol. xxi., p. 76, pl. vi., fig. 6.
1904. *Eriphyla lenticularis*, Etheridge, Second Report Geol. Survey Natal and Zululand, p. 79, pl. i., figs. 20, 21.

Remarks.—There are three examples of *Astarte* (*Eriphyla*) *lenticularis*—two belonging to the Survey Collection and one to the Hamburg Museum. The latter shows the hinge clearly. This species has been recognised by Etheridge from Umkwelane Hill (Zululand), and by Stoliczka from the Trichinopoli Group of Southern India. It occurs in the Senonian and Turonian of various parts of Europe, as may be seen from the references given above. The type came from the Aachen Greensand.

Family CRASSATELLITIDÆ.

Genus Crassatellites, Krüger.

Crassatellites africanus, sp. nov.

Plate XXXV., fig. 21. Plate XXXVI., figs. 1–3.

Description.—Shell triangular, high, regularly convex, but with a narrow, flattened area extending from the umbo to the posterior margin; height sometimes only a little less than the length. Antero-dorsal margin slightly convex. Anterior margin well rounded and passing into the curved ventral margin. Postero-dorsal margin very long, with a steep ventral slope, slightly curving or sinuous. Posterior margin very short, oblique. Posterior angle rounded. Umbones pointed, only slightly curved. Lunule large, with a sharp edge. Escutcheon large, with its edge sharply defined dorsally, but becoming indistinct ventrally.

Ornamentation consists of strong concentric ribs separated by broad furrows. Smaller ribs occur between the stronger ribs. The latter become less distinct towards the ventral margin of the valve, and usually die out at or near the margin of the small posterior area, but on the dorsal part of the valve they are sometimes continued to the margin of the escutcheon, bending at an angle in passing on to the posterior area. Margin of valves crenulate.

Length	34 .	33 .	33 .	31 .	29 .	28 mm.
Height	31 .	29·5 .	27·5 .	29 .	25 .	25·5. ,,

Affinities.—This species is distinguished by the very small posterior area, and the very short posterior margin which gives a triangular outline to the valve. It is somewhat similar to *C. compactus*, Gabb,* but is relatively higher, and is clearly distinguished by the strong concentric ribs. Two species of *Crassatellites* occur in the Ariyalúr Group,† but they are quite distinct from *C. africanus*.

* Geol. Surv. California, Palæont. ii. (1869), p. 190, pl. xxx., fig. 85.

† Stoliczka, Cret. Fauna S. India (1871), pp. 295, 296, pl. v., figs. 12–19.

Family VENERIDÆ.

Genus MERETRIX, Lamarck.

Meretrix umzambiensis, sp. nov.

Plate XXXVI., figs. 4–6.

Description.—Shell stout, convex, more or less triangular, with rounded margins, very inequilateral. Lunular margin deeply concave. Postero-dorsal margin long, curving, forming an obtuse angle with the posterior margin, which is curved and passes gradually into the ventral margin. The latter, together with the anterior margin, make a strong and regular curve. Anterior extremity rounded. Umbones pointed, with a strong anterior curvature. Lunule large, cordate. Escutcheon large, depressed, with a sharp edge.

Surface smooth, except for growth-lines, some of which, at fairly regular intervals, are more distinct than the others. Sometimes small ribs are present, especially near the margin of the lunule. The lunular tooth in the left valve is long and stout.

Length	61	.	58	.	51	.	48 mm.
Height	54	.	52	.	48	.	43 ,,

Affinities.—This species is similar to *M. plana* (Sowerby)* from the Blackdown Greensand, but is distinguished (1) by its large, deep, and sharply limited escutcheon, (2) by the greater anterior curvature of the umbones, (3) by its more concave lunular margin, (4) by the greater relative height of the valves, (5) by its stouter shell, and (6) by the longer lunular tooth.

Specimens of *Meretrix* [*Cytherea*] from Southern India have been referred to *M. plana* by Stoliczka † and his figures appear to agree closely with some examples from Blackdown, but I have had no opportunity of examining any Indian specimens. Holzapfel also identifies specimens from the Aachen Greensand with *M. plana*.

In the character of the escutcheon *M. umzambiensis* resembles *M. Renauxiana* (d'Orbigny).‡

M. umzambiensis is similar to *M. polymorpha* (Zittel), § from

* Min. Conch. vol. i. (1813), pl. xx. (lower figures), p. 58.

† Cret. Foss. S. India (1870), p. 169, pl. vii., figs. 1–4.

‡ Prodr. de Pal., vol. ii. (1850), p. 194; Pal. Franç. Terr. Crét. vol. iii. (1845), p. 447, pl. cccIxxxvi. figs. 1–3.

§ Bivalv. Gosaugeb., pt. i. (1865), p. 126, pl. iii. fig. 6.

Gosau, but has a longer lunular margin, a longer lunular tooth in the left valve, and the posterior margin is less truncated.

Meretrix euglypha, sp. nov.

Plate XXXVI., figs. 7–10.

Description.—Shell oval, of moderate or small convexity. Margin near the lunule concave. Anterior margin well rounded, and forming a continuous curve with the ventral margin. Posterior margin rounded, but often slightly truncate. Postero-dorsal margin with a gentle curvature. Umbones of moderate size, curving slightly. Lunule small, elongate, bounded by a groove.

Ornamentation consists of numerous strong, sharp, regularly concentric ribs, separated by deep and narrow grooves. The ribs are usually continued on to the lunule.

Interior of valves not seen.

Length	21 .	25 .	23 .	22 .	21 .	19 mm.
Height	25 .	20 .	19 .	18 .	17 .	15 ,,

Affinities.—*M. Hörnesi* (Zittel) * from the Gosau Beds, is similar to this species in outline and ornamentation, but the umbones have a greater curvature anteriorly, the valves are less flattened, and the lunule is smooth.

M. fabulina (Stoliczka) † differs from *M. euglypha* in the more anterior position of its umbones; in having fewer ribs, which cut the postero-dorsal margin less obliquely, and in the broader lunule and distinct escutcheon. *M. discoidalis*, Stoliczka, ‡ is less elongate.

M. arata, Gabb, § has larger and more prominent umbones and its ornamentation consists of "impressed lines."

M. Horni, Gabb, ‖ is similar to *M. euglypha*, but the posterior end is narrower, so that the outline of the valve is more trigonal.

M. (?) *kaffraria* (Etheridge) ¶ may, perhaps, be closely allied to *M. euglypha*, but the figures do not give a clear idea of the characters of the species.

This appears to be the species which was referred by Griesbach to *Venus arcotensis*, Forbes.

* Bivalv. d. Gosaugeb., i. (1865), p. 126, pl. iii., fig. 5.

† Cret. Fauna S. India, vol. iii. (1870), p. 174, pl. xvi., figs. 31–33.

‡ Ibid., p. 175, pl. vii., figs. 30, 31.

§ Geol. Surv. California, Palæont., vol. i. (1864), p. 166, pl. xxx., fig. 250.

‖ *Ibid.*, p. 164, pl. xxiii., fig. 144.

¶ Second Report Geol. Survey Natal and Zululand (1904), p. 81, pl. ii., figs. 20–22.

Family CARDIIDÆ.

Genus CARDIUM, Linnæus.

Cardium denticulatum, Baily.

Plate XXXVI., fig. 11. Plate XXXVII., figs. 1–2.

1855. *Cardium denticulatum*, Baily, Q.J.G.S., xi., p. 460, pl. xiii., fig. 4.

1870. *Cardium denticulatum*, Stoliczka, Cret. Fauna S. India, p. 214 (*Acanthocardium*).

Non 1871. *Cardium denticulatum*, Griesbach, Q.J.G.S. xxvii., p. 67, pl. iii., fig. 12.

Description.—Shell stout, inflated, oval, higher than long, only slightly inequilateral. Anterior and ventral margins rounded; posterior margin with a smaller curvature than the anterior. Posterior part of the valve sloping more abruptly than the anterior part. Umbones median, prominent, curving strongly inward and slightly forward.

Ornamentation consists of from 28 to 34 strong, sharp, much elevated ribs with spinose or knotted summits, and separated by deep furrows much broader than the ribs. On the posterior slope of the valves the ribs are less spiny and closer together; near the anterior margin they are smaller. Fine growth-lines cross the furrows and ribs. Margins of valves toothed; the tooth-like projections being especially strong on the posterior margin.

Length	26	.	24·5	. 16 mm.
Height	30·5	.	28	. 21 ,,

Affinities.—*C. denticulatum* is allied to *C. incomptum*, Forbes,* from the Trichinopoli Group, but the latter has fewer and broader ribs with stronger spines on their summits.

C. acuticostatum, d'Orbigny,† from the Quiriquina Beds, shows some resemblance to *C. denticulatum*, but its height and length are equal, or almost equal, so that the outline of the valve is more nearly circular than in *C. denticulatum;* the ribs are less distinctly

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 145, pl. xv., fig. 15. Stoliczka, Cret. Fauna S. India, vol. iii. (1870), p. 216, pl. xi., figs. 3–7.

† Voy. Amérique Mér., vol. iii. (1842), p. 120, pl. xii., figs. 19–22. D'Orbigny, Voy. Pol. Sud. (Atlas, 1847), pl. v., figs. 17–20. Moricke, Neues Jahrb. für Min. etc., Beil. Band x. (1895), p. 103. Wilckens, Ibid., Beil. Band xviii. (1904), p. 231, pl. xix., figs. 7–10.

spinose, and the lateral teeth are further removed from the cardinals.

Remarks.—Five specimens have been seen. The type is in the Museum of the Geological Society of London.

Cardium Griesbachi, sp. nov.

Plate XXXVII., figs. 3–5.

1871. *Cardium denticulatum*, Griesbach, Q.J.G.S., xxvii., p. 67, pl. iii., fig. 12 (*non* Baily).

Description.—Shell stout, inflated, oval, higher than long, only slightly inequilateral. Anterior margin with a larger curvature than the posterior margin. Ventral margin rounded. Posterior part of the valve sloping rather more rapidly than the anterior part. Umbones median, moderately prominent, curving inwards.

Ornamentation consists of from 37 to 39 strong radial ribs. Except on the posterior slope, the ribs are broad and rounded, but sometimes slightly ridged, and they bear numerous, regular, transverse ridges; the ribs are separated by very narrow furrows. On the posterior slope of the valve the ribs are narrower and have angular summits, and the furrows are broader and sometimes have a fine rib in the middle; also the ridges on the ribs are less distinct and more curved. Margin of valves with tooth-like projections which are especially strong on the posterior margin.

Length	17 .	15 .	14 .	13 .	13 mm.
Height	21·5 .	19 .	16·5 .	16 .	15·5 ,,

Affinities.—This species is similar in form to *C. denticulatum*, but has rather less prominent umbones, and is easily distinguished by the much broader and more rounded ribs, the narrower furrows, and by the transverse ridges on the ribs.

Remarks.—About 40 examples of this species have been examined, all of which were of rather small size.

The specimen of this species which was figured by Griesbach as *C. denticulatum*, is in the Hamburg Museum.

Genus PROTOCARDIA, Beyrich.

Protocardia Hillana (Sowerby) var.

Plate XXXVII., fig. 6.

In form, and in the general character of their ornamentation, the Pondoland specimens resemble *P. Hillana* (Sowerby),* of which the

* Min. Conch., vol. i. (1813), p. 41, pl. xiv.

type came from the Blackdown Greensand. In the former, however, the concentric ribs and furrows are broader and less numerous than in the examples from Blackdown. The Pondoland specimens agree closely with those from the Trichinopoli Group, which were referred by Forbes and by Stoliczka* to *P. Hillana*.

The specimens from the Libyan desert, figured as *P. Hillana* by Quaas,† have the ribbing coarser than in the examples from Blackdown. *P. biseriata* (Conrad),‡ from the Chalk of Syria, possesses still coarser concentric ornamentation.

The Pondoland form does not appear to differ from *P. Hillana* var. *umkwelanensis*, Etheridge,§ but I have had no opportunity of comparing specimens. The largest example from Pondoland which I have seen is in the Hamburg Museum, and agrees in size and form with Etheridge's figure, but possesses more numerous ribs.

P. Hillana is abundant in the Blackdown Greensand, and varies to some extent in its ornamentation, but I have seen no specimen with the ribs so coarse as in the examples from the deposits mentioned above, and usually they are considerably finer.

Family SOLENIDÆ.

Genus SOLECURTUS, Blainville.

Solecurtus? (Azor?), sp.

Plate XXXVII., fig. 7.

There are two specimens which resemble *Solen Guerangeri*, d'Orbigny,‖ but are less elongated. In this respect, however, they agree with the example of that species from the Senonian of Chlomek (Bohemia) figured by Fritsch.¶ Unfortunately the Pondoland specimens are very imperfectly preserved, so that an exact determination is at present impossible. Both specimens are left valves; one shows the exterior, but is much decorticated, so that the nature of the ornamentation cannot be seen; the other example shows the interior, but the characters of the hinge, the muscular impressions, and the

* Cret. Fauna S. India (1870), p. 219, pl. xii., figs. 8–10, pl. xiii., figs. 1–3.

† Oberst. Kreidebild. i. d. libyschen Wüste (Palæontographica, vol. xxx., 2, 1902), p. 218, pl. xxiv., figs. 18, 19.

‡ R. B. Newton, Geol. Mag. (1898), p. 400, pl. xv., fig. 11.

§ Second Report Geol. Survey Natal and Zululand (1904), p. 79, pl. i., fig. 16.

‖ Pal. Franç Terr. Crét., vol. iii. (1845), p. 321, pl. cccli., figs. 1–2. Guéranger, Album Paléont. de la Sarthe (1867), p. 12, pl. xv., fig. 4.

¶ Stud. im Geb. d. bohm. Kreidef., vi. Chlomek. Schicht. (1897), p. 58, fig. 68.

pallial line cannot be determined. Stoliczka* remarks of *Solen Guerangeri* that it "belongs apparently to *Pharella*, or possibly to *Azor*." In form the Pondoland specimens seem to approach more nearly to *Azor* than to *Pharella*.

Family TEREDINIDÆ.

Genus TEREDO, Linnæus.

Teredo, sp.

Plate XXXVII., fig. 8.

1855. *Teredina*, sp., Baily, Q.J.G.S., xi., p. 462.

Groups of somewhat irregularly curving tubes, some of which have a diameter of 18 mm., are found in pieces of wood. There is also an internal cast of the valves, showing a narrow furrow extending somewhat obliquely from the umbo to the ventral margin. Behind the umbo there is another furrow, larger and deeper, passing to the postero-ventral part of the valve.

This species was referred to the genus *Teredina* by Baily, but since the tube does not appear to have been united to the valves, and there is no evidence of the existence of accessory dorsal plates, I think that it is more likely to be a *Teredo*. Better specimens, however, are needed before its affinities can be satisfactorily determined.

Associated with the specimens mentioned above are a few internal casts of the valves of a small form, 4 or 5 mm. in height, which are probably the young of the same species.

Family POROMYACIDÆ.

Genus LIOPISTHA, Meek.

Section Psilomya, Meek.

Liopistha (Psilomya) corrugata, sp. nov.

Plate XXXVII., figs. 10–12.

Description.—Shell small, oval, moderately inequilateral, inflated, with the postero-dorsal part compressed. Anterior and posterior margins rounded. Ventral margin gently curved. Umbones very prominent, curving inward and slightly forward.

Ornamentation consists of strong, rounded concentric ribs, which disappear on the postero-dorsal part of the valve.

* Cret. Fauna S. India (1870), p. 99.

Length 9 mm.; height 6·75 mm.

Remarks.—This is distinguished from the other species of *Liopistha* by the coarser ornamentation. There are three specimens in the Museum of the Geological Society of London, all being internal casts.

Family PHOLADOMYIDÆ.

Genus GONIOMYA, Agassiz.

Goniomya, sp.

Plate XXXVII., fig. 9.

One specimen of a small *Goniomya* has been found. It is an internal cast of a right valve, and is too imperfect for specific description, but appears to be distinct from any of the few forms known from the Upper Cretaceous deposits. The posterior ribs slope towards the postero-ventral extremity, and apparently on the median part of the valves ribs were either absent or poorly developed.

SCAPHOPODA.

Family DENTALIIDÆ.

Some fragments of *Dentalium*, or an allied form, are in the Griesbach Collection, but are too imperfect for identification.

GASTEROPODA.

Family TROCHIDÆ.

Genus MARGARITA, Leach.*

Margarita radiatula (Forbes).

Plate XXXVII., fig. 13.

1846. *Trochus radiatulus*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 120, pl. xiii., fig. 11.

1868. *Solariella radiatula*, Stoliczka, Cret. Fauna S. India, vol. ii., p. 375, pl. xxiv., figs. 17–19; pl. xxviii., figs. 8, 9.

The examples of *Margarita* do not appear to differ from *M. radiatula* (Forbes) as figured and described by Stoliczka, except in the

* Dall and Pilsbury use *Margarita* in preference to *Eumargarita*, Fischer, 1885. See Tryon and Pilsbury, Man. Conch., vol. xi. (1889), p. 285.

absence of the fine spiral striæ, which may be due, as in the case of some of the Indian specimens, to imperfect preservation.

Stoliczka, from a comparison of specimens, identified *M. glaber* (Müller)* from the Aachen Greensand, with *M. radiatula*, and this identification is accepted by Holzapfel,† but not by Böhm.‡

Family NERITIDÆ.

Genus NERITA, Linnæus.

Nerita umzambiensis, sp. nov.

Plate XXXVII., figs. 14, 15.

Description.—Shell thick, semi-ovate. Height less than the greatest breadth of the last whorl. Spire very small, flat. Last whorl very large, inflated, somewhat flattened posteriorly, rounded anteriorly. Aperture nearly semicircular; anterior margin rounded, posterior more or less straightened, reaching to the level of the spire. Inner lip smooth, moderately convex, with its margin straight and rather coarsely denticulate. Outer lip thick, with its inner margin crenulate. Surface of shell smooth, except for a few indistinct growth-lines, and, in some cases, faint spiral ribs.

Length 16 mm.; breadth 21 mm.

Remarks.—This species, of which there are three specimens in the Survey Collection, appears to be distinct from any of the Cretaceous forms already described.§

Nerita kaffraria, sp. nov.

Plate XXXVII., fig. 16.

Description.—Shell semi-globose. Spire indistinct, flat. Last whorl very large, inflated, broader than long, posterior part flattened, the median part convex and rounded, the anterior part somewhat produced. Aperture large, rounded. Outer lip thin. Inner lip

* Petref. Aachen. Kreidef., pt. 2 (1851), p. 43, pl. v., fig. 6.

† Mollusk. Aachen. Kreide (Palæontographica, vol. xxxiv., 1888), p. 171, pl. xvii., figs. 7–9. Kaunhowen, Gastrop. Maestricht. Kreide (Palæont. Abhandl., viii., 1897), p. 27, pl. v., fig. 4.

‡ Verhandl. d. naturhist. Vereines d. preuss. Rheinl., vol. xlii. (1885), p. 38.

§ References to Cretaceous species of *Nerita* are given by Pethö, Die Kreide—(Hypersenon—) Fauna d. Peterwardeiner Gebirges (Palæontographica, vol. lii., 1906), pp. 109–130.

smooth, nearly flat, depressed below the level of the outer lip; with its inner margin rather coarsely denticulate.

Length 16 mm.; breadth 23 mm.

Remarks.—This species is known by a single specimen, in which the colour-bands are still fairly well preserved. It differs from *N. umzambiensis* in the posterior part of the last whorl being more flattened, whilst the anterior part is produced and less rounded; also the inner lip is nearly flat and the outer lip is thin at the margin.

Family PYRAMIDELLIDÆ.

Genus PSEUDOMELANIA, Pictet and Campiche.

Pseudomelania Sutherlandi (Baily).

Plate XXXVII., figs. 17, 18.

1855. *Chemnitzia Sutherlandii*, Baily, Q.J.G.S., xi., p. 459, pl. xii., fig. 5.

1871. *Chemnitzia undosa*, Griesbach, Q.J.G.S., xxvii., p. 65 (*non* Forbes).

1871. *Cerithium* (*Fibula ?*) *detectum*, Griesbach, ibid., p. 64 (*non* Stoliczka).

Description.—Shell turreted, consisting of eleven rather high whorls. Spire very long, acute. Sutures rather deep. Whorls near the apex are slightly convex. In the remaining whorls the greatest convexity is at the junction of the anterior third with the posterior two-thirds, the posterior part being flattened and the anterior part curving gradually to the suture. Base of last whorl rounded. Aperture ovate, angular posteriorly; inner lip thick.

Whorls near the apex ornamented with rather strong, rounded, concave, transverse ribs, with very fine ribs between them; also with small spiral ribs. The remaining whorls are ornamented with growth-ridges or lines which are indented so as to form a rounded angle at about the middle of the whorl.

Length 95 mm.; breadth 39 mm.

Affinities.—Griesbach regarded this species as identical with *P. undosa* (Forbes),* from the Trichinopoli Group. But it is distinguished from the latter by its smaller apical angle, relatively higher whorls, and much less distinct transverse ornamentation.

Griesbach also regarded *Turritella Meadi*, Baily, as a young indi-

* Stoliczka, Cret. Fauna S. India, vol. ii. (1868), p. 286, pl. xvii., figs. 19–21.

vidual of *P. Sutherlandi*. The specimens of the former are poorly preserved, but they differ clearly from *P. Sutherlandi* in having a more acute and more elongate spire, and in the possession of distinct spiral ribs. Stoliczka * examined Baily's types, and he states that "The ornamentation of this species is very like that of *Turritella multistriata*" (see p. 318).

The specimen identified by Griesbach as *Cerithium* (*Fibula ?*) *detectum*, Stoliczka, is in the Hamburg Museum, and appears to be only a water-worn example of *P. Sutherlandi*.

The imperfect specimen figured by Etheridge † as *Chemnitzia Sutherlandi ?* seems to be distinct from that species.

Remarks.—Fourteen specimens have been examined. The type is in the Museum of the Geological Society of London. Baily's figure is somewhat restored, and the flattening of the posterior parts of the whorls is not clearly indicated.

Section OONIA, Gemmellaro.

Pseudomelania (Oonia), sp.

Plate XXXVIII., fig. 1.

1855. *Turritella Renauxiana*, Baily, Q.J.G.S., xi., p. 458 (*non* d'Orbigny).

1870. *Euchrysalis gigantea*, Griesbach, Q.J.G.S., xxvii., p. 65.

An imperfect specimen, which was erroneously referred to *Turritella Renauxiana*, d'Orbigny, by Baily, is in the Museum of the Geological Society of London; the aperture is missing and the surface of the shell is worn. This specimen was seen by Stoliczka, and was identified by him with *Euchrysalis gigantea* from the Trichinopoli and Ariyalúr Groups.‡ In the Pondoland example the spire is less elongated than in *E. gigantea*. More material is needed before Stoliczka's identification can be confirmed. *Pseudomelania Stoliczkai* (Geinitz), § from the Cenomanian of Plauen, near Dresden, also resembles the form from Pondoland. Specimens of *Pseudomelania* from the Chlomek Beds have been referred to *P. gigantea* by Sturm.

* Stoliczka, Cret. Fauna S. India, vol. ii. (1868), p. 226.

† Second Rep. Geol. Survey Natal and Zululand (1904), p. 88, pl. iii., fig. 2.

‡ Cret. Fauna S. India, vol. ii. (1868), p. 289, pl. xxi., figs. 3–5.

§ Das Elbthalgeb. in Sachsen (Palæontographica, xx., pt. 1, 1874), p. 242, pl. liii., figs. 2, 3. Deninger, Die Gastrop. d. sächs. Kreidef. (Beitr. z. Paläont. u. Geol. Osterr.-Ungarns, &c., xviii., 1905), p. 12

Family SCALARIIDÆ.

Genus SCALA, Humphreys.

Scala ornata (Baily).

Plate XXXVIII., figs. 2, 3.

1855. *Scalaria ornata*, Baily, Q.J.G.S., xi., p. 459, pl. xii., fig. 2.
1871. *Scalaria turbinata*, Griesbach, Q.J.G.S., xxvii., p. 64 (*non* Forbes).

Description.—Shell elongate turbinate, imperforate, consisting of ten or eleven convex, rounded whorls, with a rounded keel at the periphery of the base. The posterior face of the keel is seen on the whorls of the spire, but may be concealed by the overlap of the last whorl. Spiral angle 27°.

Whorls ornamented with sixteen stout, rounded, transverse ribs, which are nearly straight and slightly oblique to the axis of the shell. The ribs are separated by broad, rounded interspaces, and both are crossed by fine, rounded spiral ribs separated by linear grooves. At intervals some of the spiral ribs are slightly larger than the others; near the middle of the whorl three or four smaller ribs may be seen between the larger ribs. The spiral ribs are crossed by very fine, sharp, linear, parallel, transverse ridges.

Affinities.—Griesbach thought that this species could be identified with *S. turbinata*, Forbes,* from the Ariyalúr Group, but it clearly differs from that form by its smaller spiral angle, more elongate spire, less convex whorls with the keel quite at the periphery; also the spiral ribs are placed more closely together. As was pointed out by Stoliczka, *S. ornata* is allied to *S. shutanurensis*, Stoliczka,† from the Trichinopoli Group, but in the former the spiral ribs are much finer and more uniform in size than in the latter.

The European forms to which *S. ornata* shows resemblance are *S. decorata* (Römer) ‡ and *S. Dupiniana*, d'Orbigny.§ Gardner ||

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 124, pl. xii., fig. 18. *S. subturbinata*, d'Orbigny, Prodr. de Pal., vol. ii., p. 217. Stoliczka, Cret. Fauna S. India, vol. ii. (1868), p. 232, pl. xviii., figs. 2, 3.

† Ibid., p. 233, pl. xviii., figs. 6–8.

‡ Verstein. nord-deutsch. Kreidegeb. (1841), p. 82, pl. xii., fig. 11. Geinitz, Das Elbthalgeb. in Sachsen (Palæontographica, vol. xx., 1874), pt. 2, p. 162, pl. xxix., fig. 4. Holzapfel, Mollusk. Aachener Kreide (Palæontographica, vol. xxxiv., 1888), p. 165, pl. xix., fig. 1.

§ Pal. Franç. Terr. Crét., vol. ii. (1842), p. 54, pl. cliv., figs. 10–13. Gardner, Geol. Mag. (1876), p. 106, pl. iv., figs. 5, 6.

|| Ibid., p. 107.

thought that the last was indistinguishable from *S. ornata*, but a comparison of specimens shows that *S. Dupiniana* possesses more inflated whorls, fewer transverse ribs, and coarser spiral ornamentation than *S. ornata*.

Remark.—The type is in the Museum of the Geological Society. The only other specimen seen is in the Survey Collection.

Family SOLARIIDÆ.

Genus SOLARIUM, Lamarck.

Solarium Bailyi, Gabb.

Plate XXXVIII., figs. 4, 5.

1855. *Solarium pulchellum*, Baily, Q.J.G.S., xi., p. 457, pl. xii., fig. 3.

1871. *Solarium Wiebeli*, Griesbach, Q.J.G.S., xxvii., p. 65, pl. iii., fig. 6.

1861. *Solarium* (*Architectonica*) *Bailyi*, Gabb, Proc. Amer. Phil. Soc., vol. viii., p. 95.

Non 1850. *Solarium pulchellum*, d'Orbigny, Prodr. de Pal., ii., p. 104.

Description.—Shell small, depressed, conical, sometimes nearly discoidal, consisting of five or six whorls with their upper surfaces flattened. Last whorl larger than the one preceding. External margin of shell rounded in fully-grown specimens, but thinner and somewhat sharper in small examples. Base rounded. Umbilicus small, with a diameter equal to a quarter or sometimes nearly a third of that of the base.

Upper surface of shell ornamented with numerous, narrow transverse ribs extending across the whorls somewhat obliquely. These ribs are strongest near the posterior suture, at a short distance from which they become smaller and new ribs are intercalated, or, sometimes, the old ones bifurcate. These more numerous and smaller ribs are continued on to the base of the shell, and become stronger for some distance around the umbilicus, to the margin of which they give a toothed appearance. The upper surface of the whorls is also ornamented with spiral grooves separated by broad flat interspaces; the grooves are closer together near the margin of the whorls and also on the base of the shell, but are absent where the transverse ribs become stronger around the umbilicus.

Length	7	.	6	.	5·5	.	3 mm.
Breadth	12	.	10	.	10·5	.	7·5 „

Affinities.—The height of the spire varies in different examples of this species, and the margin of the shell is more rounded in old than in young specimens. The greatest difference in appearance is due to the state of preservation of the ornamentation. In some cases the outer layer has been removed from a part or almost the whole of the shell, leaving a nearly smooth surface. An example of this kind was described and figured by Griesbach as a distinct species—*S. Wiebeli*—but, although stated by that author to be "perfectly smooth," an examination of the type specimen shows that the characteristic ornamentation is preserved near the apex and also on the base of the shell. Griesbach also mentions as a point of distinction that "each whorl is double the width of the preceding one." A comparison of Griesbach's type with specimens of *S. Bailyi* shows that this distinction does not hold good.

Solarium, sp. ind., from Umkwelane Hill, is stated by Etheridge * to "possess the general facies of *Solarium pulchellum*, Baily."

Remarks.—Four species of *Solarium* are described by Stoliczka from Southern India, but they are all clearly distinct from *S. Bailyi*. The name *pulchellus* had been previously used by d'Orbigny for another species, consequently Gabb substituted the name *Bailyi* for the Pondoland form. The type of *S. pulchellus*, Baily, is in the Museum of the Geological Society. The type of *S. Wiebeli*, Griesbach, is in the Hamburg Museum. In Griesbach's figure the width of the last whorl is relatively too great. The characteristics of the ornamentation on the upper surface of the shell are well shown in Baily's figure. Sixteen specimens of this species have been examined.

Family NATICIDÆ.

Genus NATICA, Scopoli.

Sub-genus LUNATIA, Gray.

Natica (Lunatia) multistriata, Baily.

Plate XXXVIII., figs. 6–8.

1855. *Natica multistriata*, Baily, Q.J.G.S., xi., p. 460, pl. xii., fig. 8.

Description.—Shell thick, of moderate size, higher than broad. Spire somewhat elevated, formed of four moderately convex whorls. Last whorl of moderate size, rounded. Sutures deep. A narrow part of the whorls in front of the sutures is flattened or depressed.

* Second Rep. Geol. Survey Natal and Zululand (1904), p. 88, pl. ii., figs. 35–37.

Aperture semi-lunar, oblique. Inner lip nearly straight, oblique to the axis of the shell, somewhat thickened. Umbilicus small. Surface of whorls smooth except for numerous growth-lines, and, in some cases, faint spiral ribs.

Length 15 mm.; breadth 13 mm.

Remarks.—This species belongs to the same group as *Natica lyrata* of d'Orbigny.*

The type is in the Museum of the Geological Society; the shell is missing from the spire and part of the last whorl, but is restored in Baily's figure.

Genus GYRODES, Conrad.

Gyrodes, sp.

Plate XXXVIII., figs. 9, 10.

Description.—Shell globose. Spire short, formed of four whorls. Last whorl very much larger than the preceding whorl, much broader than long, inflated, with rounded margin. Posterior part of whorls flattened or depressed near the suture. Aperture not seen. Umbilicus large.

Remarks.—There are several examples of this species, but in all the aperture is broken. It appears to resemble *G. tenellus*, Stoliczka.†

Family TURRITELLIDÆ.

Genus TURRITELLA, Lamarck.

Sub-genus ZARIA, Gray.

Turritella (Zaria) Bonei, Baily.

Plate XXXVIII., figs. 11, 12.

1855. *Turritella Bonei*, Baily, Q.J.G.S., xi., p. 458, pl. xii., fig. 7.
1871. *Turritella multistriata*, Griesbach, Q.J.G.S., xxvii., p. 64.
1904. *Zaria Bonei* (?), Etheridge, Second Report Geol. Survey Natal and Zululand, p. 85, pl. ii., figs. 28–31; pl. iii., fig. 9.

Remarks.—In the larger number of examples there are three prominent spiral ribs on each whorl and a rather large space between the suture and the first rib in front of it (fig. 12), but in several specimens the number of ribs is four or five, and in such cases one or two of the ribs may be smaller than the others (fig. 11).

* Pal. Franç. Terr. Crét., vol. ii. (1843), p. 161, pl. clxxii., fig. 5.
† Cret. Fauna S. India, vol. ii. (1868), p. 306, pl. xxii., fig. 14.

The Pondoland specimens do not seem to differ at all from the examples found in the Ariyalúr Group and figured by Stoliczka* as *Turritella* (*Zaria*) *multistriata*, Reuss. Holzapfel and Pethö have given reasons for using Goldfuss' † name, *quadricincta*, rather than *multistriata*, Reuss.

Turritella Bonei is very closely allied to *T. quadricincta*,‡ but whether or not it is identical with the latter can be determined only by a comparison of specimens, which I have had no opportunity of doing. The examples of *T. Bonei* agree more nearly with the figures of *T. quadricincta* given by Goldfuss and Pethö, than with those given by Favre, Holzapfel, and Müller.

The type specimens of *T. Meadi*, Baily, are chiefly internal casts, but in one fragment some of the shell is preserved and appears to possess more numerous ribs than *T. Bonei*. Baily's figure is a restoration, the form of the shell being drawn from an internal cast and the ornamentation from the fragment mentioned above.

The types of *T. Bonei* and *T. Meadi* are in the Museum of the Geological Society of London.

Family APORRHAIDÆ.

Genus APORRHAIS, da Costa.

Aporrhais, sp.

Plate XXXVIII., fig. 13.

Description.—Shell small, of moderate length. Spire formed of seven whorls, of which the earlier are convex and rounded, whilst the last two or three are angular owing to the development of a carina in front of the middle of the whorls; behind the carina these whorls are flattened, in front of it they are more or less concave. The whorls are ornamented with a few fine spiral ribs, and with a few, still finer transverse ribs. Last whorl with two smaller carinæ in

* Cret. Fauna S. India, vol. ii. (1868), p. 224, pl. xvii., figs. 8–14, 16.

† Petref. Germ., vol. iii. (1844), p. 106, pl. cxevi., figs. 16, 17*c*.

‡ For accounts of this species see Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, vol. xxxii., 1888), p. 157, pl. xv., fig. 16. G. Müller, Mollusk. d. Unter sen. v. Braunschweig u. Ilsede (1898), p. 99, pl. xiii., fig. 6. Quaas, Kreidebild. i. d. libyschen Wüste (Palæontographica, vol. xxx., 2, 1902), p. 246, pl. xxv., figs. 36, 37. Douvillé, Mission scient. Perse par J. de Morgan, III., iv., Paléont. (1904), p. 335, pl. xlvii., figs. 14, 15. Pethö, Kreide—(Hypersen.—) Fauna d. Peterward. Gebirges (Palæontographica, vol. lii., 1906), p. 141, pl. viii., fig. 9. Compare also *T. Binkhorsti*, Kaunhowen, Gastrop. Maestricht. Kreide (Palæont. Abhandl., vol. viii., 1897), p. 47, pl. iv., figs. 2, 3.

front of the principal carina. Posterior digitation of wing attached to a part of spire, extending over rather more than two of its whorls.

Remarks.—In the only example of this species which has been found the outer lip is very imperfect.

Genus DICROLOMA, Gabb.*

Sub-genus PERISSOPTERA, Tate.

Dicroloma (Perissoptera), sp.

Plate XXXVIII., fig. 14.

Description.—Shell elongate. Spiral angle 36°. Spire formed of eight slightly convex, non-carinate whorls, ornamented with strong, oblique, slightly curved transverse ribs, separated by broad rounded interspaces; both ribs and interspaces are crossed by numerous small spiral ribs, which are rather coarser and more widely separated just in front of the sutures than elsewhere. The last whorl is rounded, but has an indistinct ridge posterior to the middle of the whorl, and beginning at a short distance from the aperture; the transverse ribs are indistinct, and the spiral ribs can only be seen near the suture.

Remarks.—There is only one example of this species; its outer lip is not preserved.

Family STROMBIDÆ.

Genus PUGNELLUS, Conrad.

Pugnellus auriculatus, sp. nov.

Plate XXXVIII., fig. 15.

Description.—Shell stout, fusiform, consisting of seven convex whorls with deep sutures. Spire forming about a quarter of the entire length of the shell. Spiral angle about 80°. Spire and posterior part of last whorl conical. The whorls near the apex are rounded; the others are sub-angular—the angle being in front of the middle of the whorls. The posterior part of the sub-angular whorls is flattened, and bears, just in front of the suture, a spiral ridge which becomes more prominent on the last than on the earlier whorls. The anterior part of the last whorl is large and slightly convex.

The whorls, with the exception of those near the apex, are ornamented with very strong, rounded, nearly straight, transverse ribs;

* Syn. *Alaria*, Morris and Lycett, 1850 *non* Schrank, 1788.

on the penultimate and last whorls these ribs become more prominent at the angle of the whorl and on the spiral ridge in front of the suture. On the last whorl the ribs may be continued for a short distance in front of the angle but are less prominent, and bend towards the aperture. Between the ribs fine growth-lines occur.

Aperture rather long, becoming somewhat narrower in front. Anterior canal rather long, with thick walls, nearly straight, but with the extremity bent inwards to form a small, pointed projection. Outer lip thick, wing-like, with a stout lobe projecting beyond the level of the last suture, and with a deep posterior notch separating the lobe from the rest of the lip. Externally the lobe is channelled, and in front of it there is a sinuosity. Inner lip forms a large, thick, rounded mass of callus, which extends across the whorls nearly to the apex of the spire.

Length 41 mm. ; breadth 23 mm.

Affinities.—Pugnellus auriculatus appears to be readily distinguishable from the other known species by the character of its ornamentation. The genus is widely distributed and is especially characteristic of the Chalk of the Indo-Pacific region, having been found in the Libyan Desert, Madagascar, Baluchistan, Southern India, Borneo, New Zealand, Colorado, California, Texas, Utah, Wyoming, Quiriquina (Chili), and Southern Patagonia. Cossmann * states that *Strombus crassilabrum*, Zittel, from the Gosau Beds, probably belongs to this genus. In Pondicherri *Pugnellus* is found in the Valudayúr and Trigonoarca Beds, and in Trichinopoli in the Trichinopoli and Ariyalúr Groups.

Pugnellus, sp.

Plate XXXVIII., fig. 16.

1871. *Pugnellus uncatus*, Griesbach, Q.J.G.S., xxvii., p. 62 (*non* Forbes).

An imperfect specimen was identified by Griesbach with *P. uncatus* (Forbes),† but it differs from that species in several respects : the shell is more elongate, the spiral angle smaller, the whorls of the spire more flattened, the posterior part of the last whorl is concave, transverse ribs occur on the penultimate as well as on the last whorl, and spiral ribs appear to be absent. The transverse ribs become broader and more prominent where they cross the angle of the last whorl.

* Paléoconch. Comparée, vi. (1904), p. 38.

† Stoliczka, Cret. Fauna S. India, vol. ii. 1867), p. 22, pl. iii., figs. 9–13.

This species differs from *P. auriculatus* in having a smaller apical angle, and in the transverse ribs crossing the whorls obliquely and bending towards the aperture.

The aperture and outer lip are not preserved, and the callus is not developed, but the general character of the ornamentation of the shell is similar to that of some other species of *Pugnellus*. Griesbach's specimen is in the Hamburg Museum.

Family FUSIDÆ.

Genus CRYPTORHYTIS, Meek.

Cryptorhytis rigida (Baily).

Plate XXXIX., fig. 2. Plate XL., fig. 1.

1855. *Voluta rigida*, Baily, Q.J.G.S., xi., p. 459, pl. xii., fig. 4.
Non 1867. *Fasciolaria rigida*, Stoliczka, Cret. Fauna S. India, vol. ii., p. 109, pl. x., figs. 10–16.

Description.—Shell fusiform, scalariform. Spire shorter than the last whorl, consisting of six convex whorls with deep sutures. Posterior part of whorls with a concave depression or sulcus, having a tumid margin or ridge near the suture. Spiral angle 54°.

Ornamentation consists of broad, rounded, often prominent, transverse folds, which are indistinct on the posterior sulcus and disappear near the middle of the last whorl. Numerous strong, narrow, spiral ribs are present, except on the posterior sulcus, and are separated by interspaces wider than themselves. Very much finer spiral ribs cover the entire surface of the shell, and growth-lines and growth-ridges also occur.

Aperture angular behind. Outer lip crenulate, angular at the limit of the sulcus. Inner lip thin, concave. Columella without folds. Anterior canal moderately long, slightly bent.

Length 52 mm. Breadth 24 mm.

Affinities.—The specimens agree with the figure given by Baily except in having fewer and broader transverse folds. Examples from the Trichinopoli Group were identified by Stoliczka with this species, but were placed in the genus *Fasciolaria*, and have since been referred by Meek * and Cossmann † to *Cryptorhytis*, and by Dall ‡ to *Rostellites*. Whilst the Trichinopoli specimens resemble

* Invert. Cret. and Tert. Foss. U. Missouri (1876), p. 367.

† Paléoconch. Comparée, livr. iv. (1901), p. 57.

‡ Tertiary Fauna of Florida (Trans. Wagner Free Instit. Sci., vol. iii., 1890), p. 72.

in general form the species described by Baily as *Voluta rigida*, they differ in possessing folds on the columella, in the crenulate or tuberculate character of the margin in front of the suture, and in the weaker spiral ribs. M. Cossmann informs me that the columellar folds are sometimes obsolete in *Cryptorhytis*. Since this species agrees in other respects with *Cryptorhytis* it may still be placed in that genus.

Remarks.—Nine specimens have been examined. The type appears to have been lost.

CRYPTORHYTIS, sp.

Plate XL., fig. 2.

1871. *Tritonidea trichinopolitensis*, Griesbach, Q.J.G.S., xxvii., p. 62 (*non* Forbes).

A specimen, which is now in the Hamburg Museum, was identified by Griesbach as *Tritonidea trichinopolitensis* (Forbes).* It appears to me to be distinct from that form, and to resemble closely *Cryptorhytis rigida*, but differs in its less elongate shell, in the more extensive depression on the posterior part of the whorls, in the fewer and broader spiral ribs and in the less prominent transverse folds.

FAMILY TURBINELLIDÆ.

GENUS PYROPSIS, Conrad.

PYROPSIS AFRICANA, sp. nov.

Plate XXXVIII., fig. 17. Plate XXXIX., fig. 1.

Description.—Shell large, thick, globose, consisting of four or five whorls. Spire very short, with a deep suture between it and the last whorl.

Last whorl very large, ventricose, carinate. The part of the whorl behind the carina is concave, and rises just in front of the suture to form a prominent, sharp ridge, which terminates in the posterior canal, where it projects beyond the level of the apex of the spire. Between the ridge and the spire there is a deep channel. The part of the whorl in front of the carina is convex and gently rounded.

The last whorl is ornamented with numerous, rounded, spiral ribs, which are more or less nodular. On the carina the nodular character becomes more prominent. The ribs are not of uniform size, and are

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 127, pl. xv., fig. 7. Stoliczka, Cret. Fauna S. India, vol. ii. (1867), p. 126, pl. xi., fig. 4.

separated by shallow interspaces. Growth-ridges cross the spiral ribs.

Aperture very large, more or less oval, but angular anteriorly and posteriorly and at the carina. Posterior canal well developed, but short. Anterior canal rather short in old specimens, of moderate length in younger examples, slightly curved outwards. Outer lip smooth; thin, except posteriorly. Inner lip large, becoming very thick and expanded in old individuals.

Affinities.—*P. africana* resembles the examples of *Rapa cancellata* (Sowerby) figured by Stoliczka* from the Trichinopoli Group, but possesses more numerous and closer spiral ribs, a better developed posterior canal, and, in most cases, a shorter spire. Examples from the Upper Turonian and Lower Senonian of Europe have been identified with *Rapa cancellata* by Geinitz, Fritsch, Sturm, Deninger, &c.

In its well-developed posterior canal, and in the prominent ridge behind it, *P. africana* is similar to the larger example of *P. Hombroniana* (d'Orbigny) figured by Wilckens† from Quiriquina, but it differs in the character of its ornamentation.

An imperfect specimen from Umkwelane Hill (Zululand), figured by Etheridge,‡ may perhaps be related to *P. africana*.

Remarks.—There are three examples of *Pyropsis africana*, which, with the exception of the anterior canal, are well preserved. When perfect the canal may have been fairly long, but was evidently relatively longer in young than in old individuals. The posterior canal and the prominent ridge behind it appear to develop chiefly in old individuals, so that the resemblance to *Rapa cancellata* is greater in young than in old specimens. The genus *Pyropsis* is included by Zittel and by Cossmann§ in *Tudicula*, to which it is certainly closely related.

P. Brairdi, Meek and Hayden, is found in the Fox Hills Group of Missouri, and *P. coloradoensis*, Stanton, occurs in the *Pugnellus* Sandstone of the Colorado Formation of Colorado.

* Cret. Fauna S. India, vol. ii. (1867), p. 154, pl. xii., figs. 12–16, pl. xiii., figs. 1–4.

† Neues Jahrb. für Min., &c. Beil.-Band xviii. (1904), p. 213, pl. xviii., fig. 8. Also d'Orbigny, Voy. Pole Sud., &c. (1847), pl. iv., fig. 31.

‡ Second Rep. Geol. Surv. Natal and Zululand (1904), p. 85, pl. iii., figs. 10, 11.

§ Paléoconch. Comparée, iv. (1901), p. 68.

Genus PIRIFUSUS, Conrad.

Pirifusus Bailyi, sp. nov.

Plate XL., figs. 3, 4.

1871. *Pollia pondicherriensis*, Griesbach, Q.J.G.S., xxvii., p. 62 (*non* Forbes).

Description.—Shell ovate-conical. Spire moderately short, composed of four or five flattened or slightly convex whorls. Sutures deep. Last whorl large, rounded, with a sulcus in front of the suture; ornamented with strong transverse ribs, and smaller spiral ribs which give a tuberculate appearance to the transverse ribs. The transverse ribs extend across the sulcus.

Aperture large, ovate, angular and notched posteriorly. Outer lip crenulate, curving gradually to the end of the canal. Inner lip callous, extensive. Columella curved. Anterior canal short, bent, with a few small ridges on its inner border.

Remarks.—There are two imperfect specimens of this species in the Griesbach Collection; one consists of the last whorl and a part of the penultimate whorl, the other shows the spire and a part of the last whorl. These specimens were identified by Griesbach with *Pollia pondicherriensis* (Forbes),* but they seem to be quite distinct from that form. They show some resemblance to *Pirifusus fenestratus* (Müller),† and to *P. granulatus* (Stoliczka). ‡

Genus SEMIFUSUS, Swainson.

Semifusus ? (Mayeria ?), sp.

Plate XL., fig. 5.

A single specimen, in which the aperture and anterior part of the last whorl are not preserved, presents considerable resemblance to *Lagena secans*, Stoliczka,§ from the Ariyalúr Group, but differs in that the suture of the last two whorls is in front of the second carina. *L. secans* is regarded by Cossmann ‖ as probably belonging to

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 127, pl. xiii., fig. 20. Stoliczka, Cret. Fauna S. India, vol. ii. (1867), p. 127, pl. xi., figs. 10–12. ? *Cantharulus*, Cossmann, Paléoconch. Comparée, iv. (1901), p. 173.

† Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, xxxiv., 1888), p. 109, pl. x., figs. 13, 14. Cossmann, *op. cit.*, iv., p. 84, pl. vi., fig. 22.

‡ *Op. cit.*, p. 125, pl. xi., figs. 6, 7. Compare also *P. subdensatus*, Whitfield, Gasterop. and Cephalop. Raritan Clays, &c. (Mon. U.S. Geol. Survey, xviii., 1892), p. 48, pl. iv., figs 1–3.

§ Cret. Fauna S. India, vol. ii. (1867), p. 138, pl. xi., figs. 19, 20.

‖ Paléoconch. Comparée, livr. 4 (1901), p. 94.

Semifusus (*Mayeria*). Since the aperture is missing in the Pondoland specimen the generic position of the species cannot be satisfactorily determined. That species also shows some resemblance to *Serrifusus dakotensis*, Meek and Hayden, var. *vancouverensis*, Whiteaves,* of which the generic position is likewise uncertain.† Whether the two forms are really related or not cannot be determined at present.

A specimen which was recorded by Griesbach as *Lagena nodulosa*, Stoliczka, resembles the example referred to above, but possesses a shorter spire (Plate XL., fig. 6).

Family VOLUTIDÆ.

Genus VOLUTILITHES, Swainson.

Volutilithes, sp.

Plate XL., fig. 7.

A single imperfect specimen of a large Volutid is provisionally referred to the genus *Volutilithes*. The spire is short and conical. The ornamentation consists of a few strong, transverse ridges, which are prominent at the angle of the whorl but soon decrease in size anteriorly. There are also indications of spiral ribs. The aperture is broad and canaliculate posteriorly; the outer lip is toothed. On the columella there are four oblique folds, of which the two posterior are slightly stronger than the two anterior. A very small fold is present between the first and second main folds, and another between the third and fourth.

Family MITRIDÆ.

Genus TURRIS, Montfort.‡

Turris (?) kaffraria (Griesbach).

Plate XL., figs. 8, 9.

1871. *Cerithium kaffrarium*, Griesbach, Q.J.G.S., xxvii., p. 64, pl. iii., fig. 5.

Description.—Spire elongate, turreted, formed of numerous moderately convex whorls. Spiral angle 32°. Sutures deep, with the

* Mesozoic Fossils, vol. i. (1879), p. 119, pl. xv., fig. 5 (Geol. Survey, Canada). Meek, Invert. Cret. and Tert. Foss. U. Missouri (1876), p. 375, pl. xxxii., fig. 7.

† Cossmann, *op. cit.* (1901), p. 8.

‡ Syn. *Turricula*, Klein.

anterior margins somewhat tumid. Ornamentation consists of strong, slightly curved, transverse ribs—about nineteen on a whorl —separated by broader furrows. The ribs are more or less completely interrupted by a spiral furrow at a short distance in front of the suture, but appear again near the suture. The transverse ribs and furrows are crossed by small spiral ribs placed at regular intervals. Columella with three oblique folds.

Remarks.—The generic position of this species is somewhat uncertain since the character of the aperture is unknown. Griesbach referred it to *Cerithium*. The specimen which he figured does not show the columella, but in another example in his collection two of the whorls are broken across exposing the columella, on which three folds, resembling those of *Turris*, are seen. It should be noted that Griesbach's figure is enlarged about $1\frac{1}{3}$.

Family CANCELLARIIDÆ.

Genus CANCELLARIA, Lamarck.

Cancellaria meridionalis, sp. nov.

Plate XL., figs. 10, 11.

Description.—Shell ovate. Spire short, forming about a quarter of the entire length of the shell, and consisting of three or four flattened whorls. Spiral angle 82°. Last whorl large, ventricose, with a sulcus on its posterior part having a more or less sharp border in front and a tumid ridge near the suture.

Last whorl ornamented with from thirteen to fifteen strong, broad transverse ribs which extend across the posterior sulcus, but are less prominent on that part. About twelve strong, rather narrow spiral ribs cross the transverse ribs and their interspaces. The transverse ribs become rather more prominent at the margin of the sulcus, producing a tuberculate appearance. In the sulcus spiral ribs are either absent or very small. Numerous fine ridges are present, running parallel with the transverse ribs. On the penultimate whorl similar ornamentation occurs, but the whorls near the apex appear to be nearly smooth.

Aperture large, angular and canaliculate behind. Outer lip thick, with folds corresponding to the spiral ribs; curving regularly except at the level of the sulcus where it is slightly angular. Inner lip with a thin callus extending on to the whorl. Columella with two oblique folds in front of the middle. Anterior canal bent.

Length 25 mm.; breadth 17 mm.

Remarks.—This species is represented by three examples in the Survey Collection. It does not appear to resemble very closely any forms from Upper Cretaceous deposits which have already been described in the works of Stoliczka, Holzapfel, Gabb, Stanton, Kaunhowen, &c.

CANCELLARIA, sp.

Plate XL., fig. 12.

This species, which is represented by a single imperfect specimen in the Griesbach Collection, is distinguished from *C. meridionalis* by its more elongate shell, the more convex and rounded whorls of the spire, the absence of a sulcus on the posterior part of the whorls, and the much smaller transverse ribs.

FAMILY PLEUROTOMIDÆ.

GENUS ROSTELLITES, Conrad.

ROSTELLITES CAPENSIS, sp. nov.

Plate XL., fig. 13.

1871. *Fasciolaria assimilis*, Griesbach, Q.J.G.S., xxvii., p. 62 (*non* Stoliczka).

Description.—Shell slender, fusiform, consisting of about seven whorls. Spire acute, forming rather less than one-third of the entire length of the shell. Spiral angle about 48°. Whorls convex, subangular just in front of the middle. The part of the whorls behind the angle is flattened.

Most of the whorls of the spire are ornamented with nearly straight transverse ribs, which are more prominent on the anterior than on the posterior part of each whorl. On the penultimate whorl these ribs become less distinct, and on the last whorl the only ornamentation consists of numerous fine growth-lines, which on the posterior flattened part slope backwards to the suture.

Aperture long, rather narrow, passing gradually into the anterior canal. Outer lip thin, sharp. Columella with four oblique folds near the middle or just posterior to it; the anterior fold is less prominent than the other three, which are strong and narrow.

Length 63 mm.; breadth 23 mm.

Affinities.—This species resembles *R. gracilis*, Stanton,* from the *Pugnellus* Sandstone of Colorado, but differs in that the whorls are

* The Colorado Formation (Bull. U.S. Geol. Survey, No. 106, 1893), p. 157, pl. xxxiv., figs. 1–3.

sub-angular owing to the flattening of the posterior part of each, and also in possessing four folds on the columella. Both species differ from the other forms of *Rostellites* in the slight development of the ornamentation.

Rostellites is placed in the family Pleurotomidæ by Holzapfel and Cossmann, and in the family Volutidæ by Fischer and Dall.*

Remarks.—Some examples of this species were identified by Griesbach with *Fasciolaria assimilis*, Stoliczka. Eleven specimens have been seen.

Family ACTÆONIDÆ.

Genus ACTÆON, Montfort.

Actæon, sp.

Plate XL., fig. 14.

Description.—Shell moderately elongate. Spire consisting of about five moderately convex whorls. Last whorl large, somewhat cylindrical in form. Ornamentation consists of numerous narrow spiral grooves, crossed by very fine transverse ridges, and separated by rather broad, flat, smooth interspaces. The grooves are deeper and further apart on the spire than on the last whorl. Aperture long, narrow posteriorly, rounded anteriorly.

Remarks.—In form this species presents some resemblance to *Actæon curculio* (Forbes),† but is less elongate, and the spiral grooves are much more numerous.

In the only example which I have seen the surface of the shell is poorly preserved, and the aperture is imperfect, so that the generic position is not quite free from doubt.

Genus ACTÆONELLA, d'Orbigny.

Sub-genus TROCHACTÆON, Meek.

Actæonella (Trochactæon), sp.

Plate XLI., fig. 1.

The only example of *Actæonella* (*Trochactæon*) consists of an internal cast with a small part of the shell preserved at the anterior end of the aperture. The apex and one side of the spire are

* Dall, Tert. Fauna Florida, pt. i. (Trans. Wagner Free Inst. Sci., vol. iii., 1890), p. 71. Cossmann, Paléoconch. Comp., livr. 2 (1896), p. 114.

† Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 135, pl. xii., fig. 25. Stoliczka, Cret. Fauna S. India, vol. ii. (1868), p. 417, pl. xxvii., figs. 12, 13.

broken. This specimen resembles *Actæonella Beyrichi*, Drescher,* from the Lower Senonian of Löwenberg, but the spire is longer than is usually the case in *A. Beyrichi*, and the tubercles, which are found on the posterior part of the whorls at the margin of the ledge, appear to be more numerous. Without more specimens a detailed comparison is not possible, especially since *A. Beyrichi* shows considerable variation in the height of its spire and in other characters.

Actæonella cretacea (Müller),† from the Aachen Greensand, shows a slight resemblance to the Pondoland species.

Family RINGICULIDÆ.

Genus ERIPTYCHA, Meek.

Eriptycha perampla, sp. nov.

Plate XLI., fig. 2.

1871. *Avellana ampla*, Griesbach, Q.J.G.S., xxvii., p. 62 (*non* Stoliczka).

Description.—Shell globose, consisting of four convex, rounded whorls, which are slightly compressed near the suture. Spire forming about a quarter of the total height of the shell.

Ornamentation consists of linear spiral grooves separated by broad, flat, nearly smooth interspaces. The grooves are placed at nearly regular intervals, and are closer together and broader on the spire than on the last whorl; they are marked by fine transverse ridges.

Aperture large; narrow and pointed behind, broad and rounded in front. Outer lip with a narrow external thickening, which is broadest near the anterior end. Columella with a single anterior fold. Inner lip with a strong ridge.

Length 12·5 mm.; breadth 11 mm.

Affinities.—This species was identified by Griesbach with *Avellana ampla*, Stoliczka,‡ but it differs from that form in possessing considerably fewer spiral grooves, and in the grooves not being in pairs; also the interspaces appear to be without transverse ridges.

* Zeitschr. d. deutsch. geol. Gesellsch., vol. xv. (1863), p. 337, pl. ix., figs. 8–11. Sturm, Jahrb. d. k. preussisch. geol. Landesanst. für 1900, vol. xxi. (1901), p. 73, pl. v., fig. 9. Fritsch, Die Chlomeker Schichten (Stud. im Geb. d. böhm. Kreideformat., vi., 1897), p. 48, fig. 46.

† Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, vol. xxxiv., 1888), p. 82, pl. vii., figs. 11, 14–16.

‡ Cret. Fauna S. India, vol. ii. (1868), p. 420, pl. xxvi., fig. 8; pl. xxviii., fig. 20.

Avellana sculptilis, Stoliczka,* is somewhat similar in form, but its spire is more pointed, and the ornamentation is coarser.

Eriptycha Humboldti (Muller) † has a relatively higher shell and more numerous spiral grooves than *E. perampla*.

CEPHALOPODA.‡

NAUTILOIDEA.

Genus NAUTILUS, Linnæus.

Nautilus, sp.

Plate XLI., fig. 3. Text fig. 1.

Description.—Shell sub-globose, without umbilicus. Greatest thickness at from one-third to one-fourth of the height of the last whorl. Height of last whorl slightly less than its thickness, except in small specimens. Last whorl indented to about two-fifths of its height. Periphery convex and rounded. Sides convex but slightly flattened, sloping inwards to the umbilical region, where there is a broad, funnel-shaped depression. Siphuncle a little above the centre. Sutures not seen. Surface of shell nearly smooth, bearing fine growth-ridges only, which bend gently forwards in passing from the umbilical region to the sides of the shell, and afterwards curve more rapidly backwards in passing on to the periphery, where they form a broad rounded sinus.

The approximate dimensions of the largest specimen are: height 110 mm.; thickness 120 mm.; diameter 165 mm.

Remarks.—There are two more or less perfect specimens and two fragments of this species.

It shows some resemblance to *N. Dekayi* var. *montanaensis*, Meek,§ but the whorls are not so thick relatively, and the greatest thickness is not so near the umbilical region. It is also similar to

* Cret. Fauna S. India, vol. ii. (1868), p. 422, pl. xxvii., fig. 1; pl. xxviii., fig. 22.

† Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, vol. xxxiv., 1888), p. 84, pl. vi., figs. 19–21. Cossmann, Palæoconch. Comp., livr. 1 (1895), p. 124, pl. iii., figs. 10, 11.

‡ I gladly take this opportunity of expressing my thanks to Mr. G. C. Crick for assistance in comparing the Pondoland Cephalopods with specimens from Southern India in the British Museum, and for advice on several difficult points.

§ Invert. Cret. and Tert. Foss. U. Missouri (1876), p. 498, pl. xxvii., fig. 2.

the species from the Ariyalúr Group referred by Stoliczka* to *N. sublævigatus*, d'Orb., *var.*, but the thickness is much less and the sides of the aperture are less convex.

Fig. 1. *Nautilus*, sp. × ¾. South African Museum.

AMMONOIDEA.

Genus PHYLLOCERAS, Suess.

Phylloceras, sp.

Plate XLI., fig. 4.

There is one small specimen (with a diameter of 13 mm.)

* Cret. Fauna S. India, vol. i. (1866), p. 203, pl. v., figs. 1, 3. Compare also Nötling, Cret. Mari Hills (Palæont. Indica, ser. xvi., vol. i., 1897), p. 69, pl. xix., pl. xx., figs. 1, 2.

which shows some resemblance to the Indian forms of *P. Velledæ* (Michelin).* The principal difference appears to be that the ribs on the outer third of the whorl are distinctly coarser than on the inner two-thirds. The latter at first curve gently backwards, and then forwards; the coarser ribs pass directly over the external margin.

P. Velledæ is the type of de Grossouvre's genus *Schlüteria*, and occurs in the Gault of Europe, the Lower Utatúr Group of Southern India, and in the Chalk of Saghalien and Yesso; perhaps also in California and Vancouver.

Phylloceras, sp.

Plate XLI., fig. 5.

There are two specimens of *Phylloceras* which resemble *P. Forbesianum* (d'Orbigny),† but differ in having the sides of the shell flattened, and the height of the whorl rather greater. In the larger specimen the measurements are: Diameter 30 mm.; height 18 mm.; thickness 14·5 mm.

P. Forbesianum occurs in the Valudayúr Group of Pondicherri.

Genus HAUERICERAS, de Grossouvre.

Hauericeras gardeni (Baily).

1855. *Ammonites Gardeni*, Baily, Q.J.G.S., xi., p. 456, pl. xi., fig. 3.

1864. *Ammonites Gardeni*, Stoliczka, Cret. Fauna S. India, vol. i., p. 61, pl. xxxiii., fig. 4.

1879. *Ammonites Gardeni*, Whiteaves, Cret. Rocks Vancouver (Geol. Surv. Canada, Mesozoic Foss., vol. i.), p. 102.

1884. *Desmoceras Gardeni*, Zittel, Handb. d. Palæont., ii., p. 466.

1890. *Desmoceras Gardeni*, Yokoyama, Palæontographica, xxxvi., p. 184, pl. xx., fig. 10.

* D'Orbigny, Pal. Franç. Terr. Crét., vol. i. (1841), p. 280, pl. lxxxii. Pictet and Roux, Moll. Foss. Grés verts de Genève (1847), p. 30, pl. ii., fig. 1. Pictet and Campiche, Terr. Crét. de Ste. Croix, ser. 1 (1860), p. 268, pl. xxxvi., fig. 8. Stoliczka, Cret. Fauna S. India, vol. i. (1865), p. 116, pl. lix., figs. 1–4. Schmidt, Kreidef. Insel Sachalin (1873), p. 10, pl. i., figs. 3, 4. Yokoyama, Palæontographica, xxxvi. (1890), p. 177, pl. xix., fig. 1. Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix. (1895), p. 108, pl. xv., fig. 3. Whiteaves, Trans. Roy. Soc. Canada, ser. 2, vol. i. (1895), p. 128.

† Forbes, Trans. Geol. Soc., ser. 2, vi. (1846), p. 108, pl. viii., fig. 6. Compare also *P. Whiteavesi*, Kossmat, Beitr. Paläont. u. Geol. Österr.-Ungarns, &c., ix. (1895), p. 109, pl. xv., fig. 1, and vol. xi. (1898), p. 124. Stoliczka, Cret. Fauna S. India, vol. i. (1865), p. 117, pl. lix., figs. 5–7.

1895. *Desmoceras Gardeni*, Whiteaves, Trans. Roy. Soc. Canada, ser. 2, vol. i., p. 131.
1898. *Hauericeras Gardeni*, Kossmat, Beitr. z. Pal. u. Geol. Österr.-Ungarns u. d. Orients, xi., p. 123, pl. xviii., figs. 7, 8, 10.
1903. *Hauericeras Gardeni*, Whiteaves, Addit. Foss. Vancouver Cret. (Geol. Surv. Canada, Mesozoic Foss., vol. i.), p. 352.
1904. *Hauericeras Gardeni*, Yabe, Journ. Coll. Sci. Tokyo, vol. xx., p. 32.

This species has a wide geographical range. It is found in the Ariyalúr Group, and perhaps also in the Upper Trichinopoli Group of Southern India. It also occurs in Yesso and Vancouver, and is represented by a closely allied species, *H. pseudo-Gardeni* (Schlüter), in the lowest beds of the Campanian (Upper Senonian) of Europe. Pervinquière records *Hauericeras* aff. *Gardeni* from Central Tunis.

The type is in the Museum of the Geological Society of London. The ribs are not so distinct as represented in Baily's figure.

Hauericeras Rembda (Forbes).

1846. *Ammonites Rembda*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 111, pl. vii., fig. 3.
1846. *Ammonites Durga*, Forbes, ibid., p. 104, pl. vii., fig. 11.
1864. *Ammonites Rembda*, Stoliczka, Cret. Fauna S. India, vol. i., p. 63, pl. xxxiii., fig. 5.
1865. *Ammonites Durga*, Stoliczka, ibid., p. 143, pl. lxxi., fig. 5 (*non* figs. 6, 7).
1868. *Ammonites Rembda*, Stoliczka, Rec. Geol. Surv. India, vol. i., p. 33.
1871. *Ammonites Rembda*, Griesbach, Q.J.G.S., xxvii., p. 63, pl. iii., figs. 2, 3.
1897. *Puzosia Rembda*, Kossmat, Rec. Geol. Survey India, vol. xxx., p. 100.
1898. *Hauericeras Rembda*, Kossmat, Beitr. z. Pal. u. Geol. Österr.-Ungarns u. d. Orients, xi., p. 124, pl. xviii., fig. 9.

The only specimens seen are the three examples figured by Griesbach, which are now in the Hamburg Museum. *H. Rembda* is found in the Valudayúr Group of Pondicherri, and appears to be closely related to *H. Fayoli*, Grossouvre, from the Upper Campanian of Charenté. De Grossouvre records *Hauericeras* sp. *cf. Rembda* from Madagascar.

Genus PSEUDOPHYLLITES, Kossmat.

Pseudophyllites Indra (Forbes).

1846. *Ammonites Indra*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 105, pl. xi., fig. 7.
1846. *Ammonites Garuda*, Forbes, ibid., p. 102, pl. vii., fig. 1.
1865. *Ammonites Indra*, Stoliczka, Cret. Fauna S. India, vol. i., p. 112, pl. lviii., fig. 2.
1865. *Ammonites Garuda*, Stolickza, ibid., p. 149, pl. lxxiv., fig. 5.
1868. *Ammonites Indra*, Stoliczka, Rec. Geol. Survey India, vol. i., p. 34.
1879. *Ammonites Indra*, Whiteaves, Mesozoic Fossils (Geol. Survey, Canada), vol. i., pt. 2, p. 105, pl. xiii., fig. 2.
1895. *Lytoceras* (*Pseudophyllites*) *Indra*, Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., vol. ix., p. 137, pl. xvi., figs. 6–9, pl. xvii., figs. 6, 7, pl. xviii., fig. 3.
1895. *Phylloceras Indra*, var., Whiteaves, Trans. Roy. Soc. Canada, ser. 2, vol. i., p. 129.
1903. *Pseudophyllites Indra*, Whiteaves, Mesozoic Fossils, *op. cit.*, pt. 5, p. 331.
1906. *Lytoceras Indra*, Boule and Thevenin, Annal. de Paléont., vol. i., p. 44, text-fig. 2, and pl. i., fig. 1.

This species is represented in the Survey collection by portions of two large specimens, one of which had, when perfect, a diameter of about 20 cm.

Pseudophyllites Indra has a wide geographical range. It occurs in the Valudayúr and *Trigonoarca* Beds of Pondicherri, and in the Nanaimo Group of Vancouver. M. de Grossouvre considers that it is identical with *Gaudryceras Colloti*, de Grossouvre,* from the Upper Campanian of the south-east of France. It is also allied to *Gaudryceras postremum* (Redtenbacher)† from Gosau.

The type of this species, and of *Ammonites Garuda*, which was shown by Stoliczka to be only a young form of *Pseudophyllites Indra*, are in the Museum of the Geological Society of London. Both come from Pondicherri.

A small specimen of *Pseudophyllites* (pl. xli., fig. 6), is closely allied to, and perhaps identical with *P. Indra*.

* Ammon. Craie supérieur (1893), p. 229, pl. xxxvii., fig. 8. Recherch. sur la Craie supér. (1901), p. 723.

† Cephalop. d. Gosauschicht. (1873), p. 115, pl. xxvi., fig. 3.

Genus TETRAGONITES, Kossmat.

Tetragonites, sp., aff. Cala (Forbes).

Plate XLI., fig. 7.

A small specimen, having a diameter of 29 mm., appears to be closely related to, or perhaps identical with, *Tetragonites Cala* (Forbes),* which is found in the Valudayúr Group of Pondicherri. The umbilicus in this specimen is not quite so wide as in *Tetragonites Cala*, but the suture-line agrees very closely with the one figured by Kossmat.†

In the form of the shell it is also similar to *Gaudryceras Sacya* (Forbes),‡, but the suture-line differs considerably.

Genus GAUDRYCERAS, Grossouvre.

Gaudryceras Kayei (Forbes).

Plate XLI., fig. 8. Plate XLII., fig. 1.

1846. *Ammonites Kayei*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 101, pl. viii., fig. 3.
1866. *Ammonites Kayei*, Stoliczka, Cret. Fauna S. India, vol. i., p. 156, pl. lxxvii., fig. 1.
1871. *Ammonites Kayei*, Griesbach, Q.J.G.S., xxvii., p. 63.
1895. *Lytoceras Kayei*, Steinmann, Neues Jahrb. für Min., &c. Beil.-Band x., p. 86, pl. v., fig. 5.
1895. *Lytoceras* (*Gaudryceras*) *Kayei*, Kossmat, Beitr. z. Pal. u. Geol. Österr.-Ungarns u. d. Orients, ix., pp. 124, 162, pl. xvi., fig. 5, pl. xvii., fig. 2.

A small specimen of this species was obtained and identified by Griesbach. Three other small, but less perfect specimens have been found by the Survey. In India *G. Kayei* occurs in the Valudayúr Group of Pondicherri. Steinmann identifies a specimen found at Quiriquina with this species. It has also been recorded by Pervinquière from Central Tunis.

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 104, pl. viii., fig. 4.

† Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., vol. ix. (1895), p. 136, pl. xvii., fig. 12.

‡ Forbes, *op. cit.*, p. 113, pl. xiv., figs. 9, 10. Stoliczka, Cret. Fauna S. India, vol. i. (1865), p. 154, pl. lxxv., figs. 5–7, pl. lxxvi., figs. 2, 3. Kossmat, *op. cit.*, p. 119.

Gaudryceras denmanense, Whiteaves,* from the Nanaimo Group of Vancouver, is included by Kossmat in *G. Kayei*, but is regarded by Yabe as a distinct species.

Genus HOLCODISCUS, Uhlig.

Holcodiscus, sp.

Plate XLII., fig. 2.

Description.—Shell discoidal, compressed, consisting of about four whorls. Last whorl with flattened, convergent sides, and rounded periphery; its greatest thickness is near the umbilicus and is equal to about $\frac{2}{3}$ of the height; its height is about $\frac{6}{1\frac{6}{3}}$ of the diameter. Umbilicus small, with a steep margin, at the summit of which are a few pointed tubercles.

Whorls ornamented with small flexuous ribs. Last whorl with seven rather strong ribs bounded on each side by a furrow; the ribs are slightly sigmoidal, being convex forwards on the inner half of the whorl, concave on the outer half; they cut the external margin obliquely. Between the stronger ribs are several small ribs, some of which start from the tubercles at the umbilical margin; a few of the ribs bifurcate and new ribs are introduced on the outer portion of the whorl. Sutures not seen.

Diameter 26 mm.; height 12 mm.; thickness 8 mm.

Remarks.—There is only one example of this species. It appears to be distinct from the Indian species described by Stoliczka and Kossmat. In general form and in the occurrence of tubercles at the umbilical margin it shows some resemblance to *H. madrasinus*, Stoliczka,† from the Ariyalúr Group, but the ribs are much finer.

Genus SCHLŒNBACHIA, Neumayr.

Schlœnbachia Umbulazi (Baily).

1855. *Ammonites Umbulazi*, Baily, Q.J.G.S., xi., p. 456, pl. xi., fig. 4.
1871. *Ammonites Umbolazi*, Griesbach, Q.J.G.S., xxvii., p. 63, pl. iii., fig. 1.
1904. *Muniericeras* (?) *Umbolazi*, Solger, Foss. Mungokreide in Kamerun, p. 205.

Between 20 and 30 specimens of this species have been obtained by Griesbach and the Survey. One example has a diameter of

* Mesozoic Fossils (Geol. Survey, Canada), vol. i. (1879), p. 111, pl. xiii., fig. 3, and (1903) p. 329. Trans. Roy. Soc. Canada, ser. 2, vol. i. (1895), p. 129, pl. ii., figs. 1, 2. Ottawa Naturalist, vol. xv. (1901), p. 32.

† Cret. Fauna S. India (1865), p. 139, pl. lxx., figs. 1–3.

88 mm., but most of the specimens are of smaller size than the type. The ribs are not so prominent as they appear to be in Baily's figure. Kossmat * regards this species as belonging to the more involute group of *Schlœnbachia* (*Prionocyclus*).

The type cannot be found. The specimens figured by Griesbach are in the Hamburg Museum.

S. Umbulazi appears to be confined to Pondoland.

Genus EULOPHOCERAS, Hyatt.

Eulophoceras natalense, Hyatt.

Plate XLII., fig. 3.

1903. *Eulophoceras natalense*, Hyatt, Pseudoceratites of the Cretaceous (Mon. U. S. Geol. Survey, vol. xliv.) p. 86, pl. xi., figs. 2–6.

For the identification of this species I am indebted to Mr. G. C. Crick of the British Museum (Nat. Hist.). It is the type of the genus *Eulophoceras*, Hyatt. The species was founded on a single imperfect specimen which is stated to have come from 'Port Natal,' and is now in Yale Museum. Other species of *Eulophoceras* from Pondoland, of which Mr. Crick hopes to give an account of shortly, are in the British Museum.

Genus MORTONICERAS, Meek.

Mortoniceras Soutoni (Baily).

Plate XLIII., fig. 1.

1855. *Ammonites Soutonii*, Baily, Q.J.G.S., xi., p. 455, pl. xi., fig. 1.

1895. *Mortoniceras Soutoni*, Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix., p. 184.

1904. *Mortoniceras* (?) *Soutoni*, Solger, Foss. Mungokreide in Kamerun, p. 205.

This species is closely allied to *M. texanum* (Römer) † from the Austin Chalk of Texas, but the ribs are more numerous than in Römer's type, and there are some differences in the sutures. According to de Grossouvre ‡ *M. texanum* is found in the Lower Santonian

* Jahrb. d. k.k. geol. Reichsanst., vol. xliv. (1894), p. 464.

† Kreidebild. v. Texas (1852), p. 31, pl. iii., fig. 1. Lasswitz, Kreide-Ammoniten v. Texas (Geol. u. Palæont. Abhandl. v. Koken, N.F., vi., 1904), p. 30, pl. vii., fig. 2. Gerhardt, Neues Jahrb. für Min., &c., Beil.-Bd. xi. (1897), p. 70, pl. i., fig. 1.

‡ Les Ammonites de la Craie supér. (1903), p. 80, pl. xvi., figs. 2–4, pl. xvii., fig. 1.

of Europe, but Lasswitz,* who has recently given a revision of the Chalk Ammonites of Texas in Römer's collection, considers that the examples figured by de Grossouvre belong to another species—*Ammonites quinquenodosus*, Redtenbacher, whilst he regards *Mortoniceras campaniense*, de Grossouvre,† as an example of *M. texanum* (Römer). If this view is correct then the horizon of *M. texanum* in Europe is Campanian. M. de Grossouvre ‡ considers that *M. Soutoni* is related to *M. Bontanti*, § but it appears to me to differ considerably from that species, and to resemble much more closely *M. texanum*.

Examples of *Mortoniceras* from Algeria, Palestine, and Venezuela have been referred to *M. texanum*. *Mortoniceras* appears to be unknown in the Senonian of India. The individuals of *M. Soutoni* attain a very large size. The largest at present known is the type which is in the Museum of the Geological Society, and has a diameter of nearly 48 cm.

Mortoniceras Stangeri (Baily).

Plate XLIV., fig. 1.

1855. *Ammonites Stangeri*, Baily, Q.J.G.S., xi., p. 455, pl. xi., fig. 2.
1872. *Ammonites Stangeri*, Schlüter, Cephalop. d. oberen deutsch. Kreide, p. 45.
1895. *Mortoniceras Stangeri*, Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix., p. 184.
1904. *Mortoniceras* (?) *Stangeri*, Solger, Foss. Mungokreide in Kamerun, p. 205.

This species has been compared with *Peroniceras subtricarinatum* (d'Orb.) by de Grossouvre,‖ but though it is, as pointed out by Kossmat, like *Peroniceras* in the young stages, it subsequently develops the characteristics of *Mortoniceras*.

M. Stangeri appears to be confined to Pondoland. The individuals do not reach so large a size as in the case of *M. Soutoni*. The type has a diameter of 32 cm., and is in the Museum of the Geological Society of London.

* *Op. cit.*, p. 31, pl. viii., fig. 4.

† This has since been identified by de Grossouvre with *M. delawarense* (Morton). See Grossouvre, Recherch. sur la Craie supér. (1901), p. 379.

‡ Recherch. sur la Craie supér. (1901), p. 926.

§ Ammonites de la Craie supér. (1893), p. 77, pl. xvii., figs. 2, 3.

‖ Amm. de la Craie supér. (1893), p. 94, pl. x., figs. 1, 2, pl. xi., fig. 1.

Genus HETEROCERAS, d'Orbigny.

Heteroceras, sp.

Plate XLII, fig. 4.

A small portion of a specimen of *Heteroceras* is elliptical in section, and is ornamented with strong, oblique ribs, which become obsolete on the inner margin of the whorl. At intervals some of the ribs are more prominent than the others; between the prominent ribs from four to six of the smaller ribs are seen.

This species shows some resemblance to *H. Reussianum* (d'Orbigny),* but the ribs are more widely separated, and the more prominent ribs are not produced into spines.

Heteroceras, sp.

Plate XLII., fig. 5.

Some portions of the evolute part of a species of *Heteroceras* show a slightly elliptical or nearly circular section, and are ornamented with numerous, sharp, narrow ribs which cross the whorls somewhat obliquely and do not bear tubercles. The sutures are deeply divided.

This species shows some resemblance to *H. indicum* (Stoliczka) † but the whorls are more slender and the transverse constrictions appear to be absent.

Genus HAMITES, Parkinson.

Sub-genus ANISOCERAS, Pictet.

Hamites (Anisoceras) subcompressus, Forbes.

Plate XLIII., fig. 2.

1846. *Hamites subcompressus*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 116, pl. xi., fig. 6.

1866. *Anisoceras indicum*, Stoliczka, Cret. Fauna S. India, vol. i., p. 181, pl. lxxxv., figs. 1–5 (non *H. indicus*, Forbes).

1895. *Hamites* (*Anisoceras*) *subcompressum*, Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix., p. 145, pl. xix., figs. 10–12.

?1903. *Anisoceras subcompressum*, Whiteaves, Mesozoic Fossils (Geol. Survey, Canada), vol. i., pt. 5, p. 338, pl. xlv. fig. 1.

* For references to figures and descriptions of this species see Woods, Q.J.G.S., lii. (1896), p. 74.

† Cret. Fauna S. India, vol. i. (1866), p. 184, pl. lxxxvi., fig. 1.

There is a portion of an example of this species which seems to agree perfectly with the Indian specimens and with the figures given by Forbes, Stoliczka, and Kossmat. In Southern India *Hamites* (*Anisoceras*) *compressus* occurs in the Valudayúr Group and perhaps also in the Utatúr Group. A very closely allied form is figured by Whiteaves from the Nanaimo Group of Vancouver.

Hamites (Anisoceras) indicus, Forbes.

Plate XLIV, fig. 2.

1846. *Hamites indicus*, Forbes, Trans. Geol. Soc., ser. 2, vol. vii., p. 116 (*non* pl. xi., fig. 4).
1866. *Anisoceras subcompressum*, Stoliczka, Cret. Fauna S. India, vol. i., p. 179, pl. lxxxv., fig. 7.
1866. *Anisoceras rugatum*, Stoliczka, ibid., p. 178, pl. lxxxv., figs. 10–13.
1866. *Anisoceras tenuisulcatum*, Stoliczka, ibid., pl. lxxxv., fig. 14 (*non* figs. 15, 16).
1871. *Anisoceras rugatum*, Griesbach, Q.J.G.S., xxvii., p. 63, pl. iii., fig. 4.
1895. *Hamites* (*Anisoceras*) *indicus*, Kossmat, Beitr. z. Paläont u. Geol. Österr.-Ungarns, &c., ix., p. 145, pl. xix., fig. 4.

A small portion of an example of this species was figured by Griesbach as *Anisoceras rugatum*, and is now in the Hamburg Museum. A small example of *Anisoceras*, which was collected by the Survey, probably belongs to this species. The Indian specimens occur in the Valudayúr Group of Pondicherri.

Hamites (Anisoceras), sp.

Plate XLIV., fig. 3.

There are two imperfect specimens of a species in which the ribs are sharp and very oblique, and the section of the shell is elliptical or nearly circular. This species differs from *H.* (*Anisoceras*) *indicus* by the obliquity of the ribs and the elliptical section; and from *H.* (*Anisoceras*) *tenuisulcatus*, Forbes,* by the fewer, stronger, and more oblique ribs.

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 116, pl. x., fig. 8, pl. xi., fig. 3. Stoliczka, Cret. Fauna S. India, vol. i. (1866), p. 177, pl. lxxxv., figs. 15, 16 (not fig. 17). Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix. (1895), p. 147, pl. xix., figs. 5, 6.

Genus BACULITES, Lamarck.

Baculites sulcatus, Baily.

Plate XLIV., fig. 4.

1855. *Baculites sulcatus*, Baily, Q.J.G.S., xi., p. 457 (*partim*), pl. xi., fig. 5*c* (*non* 5*a*, *b*).

B. sulcatus of Baily included two species. In the smaller example figured by that author, for which the name *sulcatus* is obviously appropriate, there are strong rounded ribs which extend obliquely backwards from the siphonal margin; below the middle of the shell they become broader and bend towards the anti-siphonal margin. Between the ribs are broad, rounded furrows. The section of the shell is oval, and more compressed on the siphonal than on the anti-siphonal side. The sutures are not visible. The only specimens seen are the types in the Museum of the Geological Society of London.

The ribs are somewhat similar to those of *B. anceps*, d'Orbigny,* but the shell is much less ovate in section, and the siphonal margin is more rounded. In *B. vertebralis*, Lamarck,† the ribs are not so strong as in *B. sulcatus*.

Baculites Bailyi, sp. nov.

Plate XLIV., fig. 5.

1855. *Baculites sulcatus*, Baily, Q.J.G.S., xi., p. 457 (*partim*), pl. xi., fig. 5*a*, *b* (*non* 5*c*).

Description.—Shell increasing in diameter very slowly. Section oval, compressed, rather narrower on the siphonal than on the anti-siphonal side. A small carina is seen in specimens which have the shell well-preserved. Lobes and saddles narrow and rather deep; the superior-lateral lobe is symmetrically divided by a deep rounded saddle, and each part is divided by a similar but rather smaller saddle.

Ornamentation consists of small, inconspicuous ribs, which bend rapidly backwards from the siphonal margin; below the middle of the shell they curve round and pass forward over the anti-siphonal margin.

* Pal. Franç. Terr. Crét., vol. i. (1842), p. 565, pl. cxxxix., figs. 1–7. Schlüter, Cephalop. oberen deutsch. Kreide (1876), p. 145, pl. xl., fig. 2.

† Binkhorst, Gastérop. et Cephalop. Craie supér. du Limbourg (1861), p. 40, pl. v*d*., fig. 1. Schlüter, *op. cit.*, p. 143 l. xxxix., figs. 11–13, pl. xl., figs. 4, 5, 8.

Affinities.—This species appears to be related to *B. teres*, Forbes,* but possesses an oval, instead of a circular or nearly circular section, and fine ribs instead of gentle undulations across the siphonal margin. *B. teres* is found in the Valudayúr Group of Pondicherri.

Remarks.—*B. Bailyi* is easily distinguished from *B. sulcatus* by the character of the ribs. The specimen figured by Baily may be taken as the type of the species. Several other specimens were collected by the Survey and by Griesbach. The ribs are not so conspicuous as they are represented in Baily's figure.

Baculites capensis, sp. nov.

Plate XLIV., figs. 6, 7.

Description.—Shell large, increasing in diameter very slowly. Section ovate; sides flattened. Siphonal margin rounded, narrower than the anti-siphonal margin. On each side of the shell, at a short distance from the anti-siphonal margin, there is a row of large, blunt tubercles which are elongated longitudinally. The surface of the shell is ornamented with small, rounded, sometimes indistinct transverse ribs; in passing from the siphonal margin on to the sides they bend rapidly backwards, thus becoming very oblique, but at the level of the row of tubercles they curve round and pass forwards over the anti-siphonal margin where they form a broadly rounded fold. Just above the row of tubercles, at about the middle of the shell, there is a shallow longitudinal sulcus.

The largest specimen is 24 mm. in height and 18 mm. in width.

Affinities.—This species is closely allied to *B. incurvatus*, Dujardin,† which occurs in the Senonian of Europe, but it differs in having a longitudinal sulcus on the side of the shell, and in the tubercles being elongated instead of rounded. There are also some small differences in the sutures.

* Trans. Geol. Soc., ser. 2, vol. vii. (1846), p. 115, pl. x., fig. 5. Stoliczka, Cret. Fauna S. India, vol. i. (1866), p. 197, pl. xc., fig. 12. Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix. (1895), p. 155. The type of *B. teres* is in the Museum of the Geological Society of London.

† Mém. Soc. géol. de France, ii. (1837), p. 232, pl. xvii., fig. 13. D'Orbigny, Pal. Franç. Terr. Crét., i. (1842), p. 564, pl. cxxxix., figs. 8–10. Fritsch and Schlönbach, Cephalop. d. böhm. Kreidef. (1872), p. 51, pl. xiii., fig. 21. Schlüter, Cephalop. oberen deutsch. Kreide (1876), p. 142, pl. xxxix., figs. 6, 7, pl. xl., fig. 3. Fritsch, Stud. d. böhm. Kreidef. vi. Chlomeker Schichten (1897), p. 40, fig. 23. Holzapfel, Mollusk. Aachen. Kreide (Palæontographica, vol. xxxiv., 1887), p. 64, pl. iv., figs. 5, 6.

Another allied species is *B. asper*, Morton,* which differs in having larger and transversely elongated tubercles. *Baculites vagina*, Forbes,† belongs to the same group of species but is clearly distinct from *B. capensis*.

Genus SCAPHITES, Parkinson.

Scaphites, sp.

Plate XLIV., fig. 8.

Description.—The whorls of the involute part are rounded but become somewhat flattened in approaching the evolute part of the shell. Umbilicus rather large. The evolute part increases in height only slightly in passing from the involute part towards the aperture; its sides are flattened, and its external margin is moderately broad and rounded.

The involute part is ornamented with a few strong, nearly straight ribs which are continued over the external margin and sometimes bifurcate; one or two more ribs are intercalated at the external margin. On the evolute part a few tubercles form a row near the external border of the side of the shell, and each tubercle is continued as a strong, rather oblique rib across the whorl to the inner margin where another tubercle may be developed. On the external margin there are smaller and fairly numerous ribs.

Suture line: saddles broader than lobes, with rounded terminations. Siphonal lobe deep, broader than the superior-lateral lobe which is divided into two nearly symmetrical parts each having three digitations of which the lowest is the largest. Inferior-lateral much smaller than the superior-lateral lobe, and divided into two parts. Siphonal saddle very broad, divided into two parts of which the outer is much larger than the inner. Superior-lateral and inferior-lateral saddles much smaller than the siphonal saddle, each divided by a small lobe into two broadly rounded parts.

Remarks.—This species is known at present by one somewhat imperfect specimen. It shows some resemblance to *S. Meslei*, de Grossouvre,‡ from the Coniacian of France, but the height of the

* Synopsis Org. Rem. Cret. U.S. (1834), p. 43, pl. i., figs. 12, 13, pl. xiii., fig. 2. Römer, Kreidebild. v. Texas (1852), p. 36, pl. ii., fig. 2. Stanton, Colorado Formation, Bull. U.S., Geol. Survey, No. 106 (1893), p. 167, pl. xxxvi., figs. 4, 5.

† Stoliczka, Cret. Fauna S. India, vol. i. (1866), p. 198, pl. xc., figs. 14, 15, pl. xci., figs. 1–6. Kossmat, Beitr. z. Paläont. u. Geol. Österr.-Ungarns, &c., ix. (1895), p. 155, pl. xix., figs. 13–17.

‡ Ammonites de la Craie supér. (1893), p. 239, pl. xxxii., figs. 4, 7.

evolute part remains more uniform and is relatively less throughout; also the tubercles are near the outer margin.

The ornamentation on the evolute part is somewhat similar to that of one of the specimens of *S. similaris* figured by Stoliczka,* but the ribs are fewer and stronger.

THE AFFINITIES, DISTRIBUTION AND AGE OF THE FAUNA.

The resemblance between the Cretaceous faunas of Pondoland and Southern India, to which attention has been called by previous writers, consists to a larger extent in the occurrence of allied species, and in almost the same assemblage of genera, than in the presence of the same species in both regions. Thus, out of a total of 92 species which have now been found in Pondoland only 10 are known to occur in Southern India. The proportion of the species common to both is greater in the Cephalopoda than in other groups.

The species found in both regions are:—

Pecten (*Neithea*) *quinquecostatus*, Sow.
Astarte (*Eriphyla*) *lenticularis* (Goldf.).
Margarita radiatula (Forb.).
Turritella (*Zaria*) *Bonei*, Baily.
Hauericeras Gardeni (Baily).
,, *Rembda* (Forb.).
Pseudophyllites Indra (Forb.).
Gaudryceras Kayei (Forb.).
Hamites (*Anisoceras*) *subcompressus*, Forb.
,, (,,) *indicus*, Forb.

It will be noticed that all of these, with the exception of the last two, are widely distributed forms. In addition to these, Griesbach identified 10 other species of Gasteropods with forms found in Southern India; but after examining Griesbach's specimens I am unable, as will be seen from the preceding account, to accept those identifications.

In addition to the species mentioned above as common to Pondoland and Southern India there are 11 species of Mollusca represented by allied forms.

If the Ammonites be taken as the sole guide in correlation, then it is clear that the Cretaceous deposit of Pondoland is represented by the Ariyalúr Beds of Trichinopoli, and the Valudayúr and *Trigonoarca* Beds of Pondicherri, because all the species which are common to

* Cret. Fauna S. India, vol. i. (1866), p. 167, pl. lxxxi., fig. 6. Rec. Geol. Survey India, vol. i. (1868), p. 36.

the two regions occur in the Ariyalúr Beds or in their equivalents the Valudayúr and *Trigonoarca* Beds, and not one (with the possible exception of *Hauericeras Gardeni*) is found in the Trichinopoli Beds below. The abundance of *Hamites* (*Anisoceras*) and the presence of *Tetragonites* aff. *Cala* in Pondoland form a further link with the Valudayúr Beds.

If, however, we compare only the Lamellibranchs and Gasteropods and take into account both identical and allied forms, then the relationship of the Pondoland deposit seems to be as close to the Trichinopoli Beds as to the beds of Ariyalúr age. But it is difficult to know what value to give in correlation to the evidence furnished by *allied* forms, and likewise to determine whether the resemblance in the gasteropod and lamellibranch faunas is not due to similarity of conditions rather than to identity in age. In any case, for the correlation of deposits so widely separated as those of South Africa and Southern India, the evidence of the Cephalopods will be admitted to be of far greater importance than that of other groups of fossils.

Of the Lamellibranchs and Gasteropods found in Pondoland and represented in Southern India by either identical or allied species the following occur in, but *not above*, the Trichinopoli Group: *Trigonoarca capensis* (Griesb.), *Astarte* (*Eriphyla*) *lenticularis* (Goldf.), *Cardium denticulatum*, Baily, *Protocardia Hillana* (Sow.), *Scala ornata* (Baily), and *Cryptorhytis rigida* (Baily). On the other hand, forms allied to the following species do not occur *below* the Ariyalúr Beds: *Nemodon natalensis* (Baily), *Inoceramus expansus* Baily, *Semifusus* (*Mayeria*) sp., and perhaps *Meretrix umzambiensis*, sp. nov.

The following species or forms allied to them are found in both the Trichinopoli and the Ariyalúr Groups: *Pecten* (*Neithea*) *quinquecostatus*, Sow., *Margarita radiatula* (Forb.), *Pseudomelania* (*Oonia*) sp., and *Turritella Bonei*, Baily.

Kossmat* has expressed the opinion that the upper part of the Trichinopoli Group, as well as the Ariyalúr Group, is represented in the Pondoland deposit. But the Ammonites seem to give no evidence for the existence of the former horizon, and I believe that the whole of the Pondoland deposit is of the age of the Ariyalúr Group.

M. A. de Grossouvre† doubts the correctness of the view of the close affinity between the Pondoland and South Indian faunas which

* Rec. Geol. Surv. India, vol. xxx. (1897), p. 71.

† Recherch. sur la Craie Supér. (1901), pp. 926, 927.

was put forward by Baily and by Griesbach, and was supported by Kossmat after a careful study of the geographical distribution of the Ammonites of Southern India. M. de Grossouvre concludes that the Pondoland fauna is at least as closely related to the fauna of the Chalk of Europe as to that of Southern India.

Whilst it must be allowed that the relationship of the Pondoland and South Indian faunas is not so close as Griesbach supposed, there is nevertheless a considerable resemblance between them, and it seems to me to be greater than the resemblance of the Pondoland fauna to that of the European Chalk. Only three species appear to be common to Pondoland and Europe, viz., *Pecten* (*Neithea*) *quinquecostatus*, Sow., *Astarte* (*Eriphyla*) *lenticularis* (Goldf.), and *Pseudophyllites Indra* (Forb.). Eleven others are represented in Europe by allied forms, viz., *Inoceramus expansus*, Baily, *Protocardia Hillana* (Sow.), *Margarita radiatula* (Forb.), *Pseudomelania* (*Oonia*) sp., *Turritella Bonei*, Baily, *Actæon* (*Trochactæon*), sp., *Hauericeras Gardeni* (Baily), *H. Rembda* (Forb.), *Gaudryceras Kayei* (Forb.), *Mortoniceras Soutoni* (Baily), and *Baculites capensis* sp. nov. The resemblance is naturally greater to the European faunas which are of fairly shallow water character than to those of deep water.

A point of difference between the Pondoland and South Indian faunas is seen in the presence of the genus *Mortoniceras*, which is abundant in the former, but apparently does not occur in the Trichinopoli and Ariyalúr horizons of India. This genus is also well represented in Europe and North America. Another difference is the absence of *Pachydiscus* in Pondoland, whilst it is well represented in Southern India.

De Grossouvre considers that the Pondoland deposits are of Lower Senonian age, and belong in part at least to the Coniacian. He places them at the limit of the Coniacian and Santonian divisions, but admits that the existence of Campanian (Upper Senonian) is indicated by the presence of *Pseudophyllites Indra* and *Gaudryceras Kayei*. The opinion that the deposits are of earlier date than the Campanian appears to be based chiefly on the presence of *Mortoniceras Soutoni* and *M. Stangeri*, which De Grossouvre regards as closely allied to species found in the Coniacian and Santonian stages in Europe. Another allied species of *Mortoniceras* does, however, occur in the Campanian of Europe. That the two Pondoland species (*M. Soutoni* and *M. Stangeri*) are really of Campanian age is, I think, established by their association *in the same bed* with *Hauericeras Rembda*, *Gaudryceras Kayei*, and *Hamites* (*Anisoceras*) *indicus*, not one

of which occurs below the Valudayúr Beds which are admitted to be of Campanian age. Further, the absence of any horizon in Pondoland earlier than the Campanian is shown by the fact that specimens of *Pseudophyllites Indra* were found by the Survey in the basement bed of the deposit. The probability that one zone only is represented is supported by the observations made by the Survey that most of the species range throughout the deposit, as well as by the small thickness of that deposit.

Schlœnbachia Umbulazi was regarded by Kossmat as probably a Lower Senonian form, but its horizon is similarly fixed by its association with characteristic Campanian species.

Rocks of the same age as those of Pondoland are found along the coast of Zululand from Port Durnford to beyond St. Lucia Bay, and are probably continued as far north as Delagoa Bay. An account of the fossils from one part of this region, Umkwelane Hill north of St. Lucia Bay, has been given by Mr. R. Etheridge.*

Still further north, on the coast at Sofala, in lat. 20° S., the presence of beds of the same age is indicated by the occurrence of *Alectryonia ungulata* (Schlotheim).†

Deposits representing the Ariyalúr Beds have been proved to occur near the coast on the north, east, and south-west of Madagascar. Thus from Diego Suarez M. de Grossouvre‡ has recorded *Nautilus Bouchardi, Scaphites* sp., *Hauericeras* sp. cf. *Rembda, Brahmäites Brahma, Puzosia* sp., and *Phylloceras* sp., and he concludes that the fauna is closely related to that of the Ariyalúr deposits of Southern India. On the east coast of Madagascar Cretaceous fossils have been found at Fanivelona and Marohita, and have been described by Prof. Boule and MM. Thevenin and Lambert.§ Nearly all of the Mollusca are found in the Cretaceous rocks of Southern India. The following species are recorded :—

Lytoceras Indra (Forb.).
Volutilithes fanivelonensis, Boule and Thev.
Fusus excavatus, Blanf.
Pugnellus crassicostatus, Nötl.
Turritella cf. *difficilis*, d'Orb.
,, cf. *nodosa*, Röm.
,, *Breautiana*, d'Orb.
Ostrea (*Alectryonia*) *ungulata*, Schlöth.
,, (*Gryphea*) *vesicularis*, Lam.

* Second Report Geol. Survey Natal and Zululand (1904), p. 71.

† R. B. Newton, Journ. Conch., viii. (1896), p. 136.

‡ Bull. Soc. géol. de France, ser. 3, vol. xxvii. (1899), p. 378.

§ Annal. de Paléont., vol. i. (1906), p. 43. Lambert, Bull. Soc. géol. de France, ser. 3, vol. xxiv. (1896), p. 313, and *ibid.* ser. 4, vol. iii. (1903), p. 75. *Alectryonia ungulata* and other species are recorded from Madagascar by R. B. Newton, Q.J.G.S., xlv. (1889), p. 333.

Ostrea, cf. *Nicaisei*, Coq.
Spondylus calcaratus, Forb.
Trigonia, cf. *scabra*, Lam.
Glycimeris orientalis (Forb.).
Anatina (*Cercomya*) *arcuata*, Forb.
Cyprina cordialis, Stol.
Epiaster nutrix, Lamb.
Hemiaster, sp.
Nætlingia Boulei, Lamb.

At Tullear, on the west coast, *Pachydiscus colligatus* has been found.

The discovery of Senonian deposits in Madagascar has obviously an important bearing on the question of a land connection between South Africa and Southern India which many writers believe to have existed at this period. In connection with this subject, attention may be called to the resemblance which Pervinquiére * has shown to exist between the Upper Cretaceous faunas (especially the Senonian) of Tunis and Southern India, which resemblance he considers can be explained only by a direct marine communication between the two regions. The absence of this land barrier would account more readily for the resemblance between the faunas of Southern India and those of Central Europe, than if the migration took place by way of South Africa as supposed by Kossmat.†

Deposits of the same age as that of Pondoland, and possessing more or less similar faunas, have been found in Assam, Borneo, Yesso (Hokkaido), Vancouver Island (Nanaimo Group), California (upper part of Chico Series), and Quiriquina (Chili).

* Étude géol. de la Tunisie Centrale (1903), pp. 64–152.

† Kossmat, Jahrb. d. k. geol. Reichsanst. xliv. (1894), p. 466. Rec. Geol. Survey India, xxviii. (1895), p. 45, and *ibid.* xxx. (1897), p. 75. Geol. d. Sokótra, &c., Denkschr. d. k. Akad. Wissen. Math.-nat. Cl., vol. lxxi. (1902), pp. 61, 62.

Distribution of the Echinoidea, Polyzoa, and Mollusca.

[The presence of a species is indicated by ×. The occurrence of an allied species is shown by the letter *a*. In the European column the horizons are shown by the abbreviations Cret., Cen., Tur., Sen., and Camp., for Cretaceous, Cenomanian, Turonian, Senonian, and Campanian respectively.]

Pondoland	Trichinopoli District. Utatúr Group.	Trichinopoli Group.	Ariyalúr Group.	Pondicherri District. Valudayúr Beds.	Trigonoarca Beds.	Europe	Page.
Echinoidea.							
Cidaris, sp. *cf. hirudo*, Sorig.	*a*					*a* Cen. Tur.	276
Pseudodiadema Griesbachi, Woods							276
Cassidulus umbonatus, Woods							277
Cardiaster africanus, Woods							279
Hemiaster Forbesi, Baily							280
Polyzoa.							
Berenicea gracilis (M. Edw.)						× Cret.	282
Etea meridiana, Lang							283
Membranipora irregularis (d'Orb.)						× Sen.	285
,, *perforata* (Reuss)						× Cen.	286
Eschara Royana, d'Orb.						× Sen.	286
,, *Delarueana*, d'Orb.						× Sen.	286
Lamellibranchia.							
Nuculana, sp.							287
Arca, sp.							287
Barbatia meridiana, Woods							287
,, sp.							288
Trigonoarca capensis (Griesb.)		*a*					288
Nemodon natalensis (Baily)			*a*	*a*	*a*		289
Pectunculus africanus, Griesb.							291
Trigonia Shepstonei, Griesb.							292
,, *elegans*, Baily							293
Mytilus, sp.							294
Modiola kaffraria, Woods							294
Pecten (*Chlamys*) *amapondensis*, Griesb.							295
,, ,, *capensis*, Woods							296
,, (*Æquipecten*) *Kossmati*, Woods							297
,, (*Camptonectes*), sp.							297
,, (*Neithea*) *quinquecostatus*, Sow.	×		×			× Cret.	298
Ostrea, sp.							299
Exogyra, sp.							299
Inoceramus expansus, Baily			*a*			*a*	299
Astarte Griesbachi, Woods		?*a*					300
,, (*Eriphyla*) *lenticularis* (Goldf.)		×				× Tur. Sen.	301
Crassatellites africanus, Woods							303
Meretrix umzambiensis, Woods		?*a*	*a*[1]				304
,, *euglypha*, Woods							305
Cardium denticulatum, Baily		*a*					306
,, *Griesbachi*, Woods							307
Protocardia Hillana (Sow.), *var.*		*a*				*a* U.Cret.	307
Solecurtus ? (*Azor ?*), sp.							308
Teredo, sp.							309
Liopistha (*Psilomya*) *corrugata*, Woods							309
Goniomya, sp.							310
Scaphopoda.							
Dentalium, sp.							310

[1] Either very near to or actually from the Ariyalúr Group.

Pondoland.	Trichinopoli District. Utatúr Group	Trichinopoli Group.	Ariyalúr Group.	Pondicherri District. Valudayúr Beds.	Trigonarca Beds.	Europe.	Page.
GASTEROPODA.							
Margarita radiatula (Forbes)	?×	×	×			*a* Sen.	310
Nerita umzambiensis, Woods							311
,, *kaffraria*, Woods.....							311
Pseudomelania Sutherlandi (Baily) ..							312
,, (*Oonia*), sp.		*a*	*a*			*a* Sen.	313
Scala ornata (Baily)		*a*					314
Solarium Bailyi, Gabb							315
Natica (*Lunatia*) *multistriata*, Baily							316
Gyrodes, sp.....							317
Turritella (*Zaria*) *Bonei*, Baily		×	×			*a* Sen.	317
Aporrhais, sp.							318
Dicroloma (*Perissoptera*), sp.....							319
Pugnellus auriculatus, Woods							319
,, sp.							320
Cryptorhytis rigida (Baily)		*a*					321
,, sp							322
Pyropsis africana, Woods							322
Pirifusus Bailyi, Woods							324
Semifusus? (*Mayeria?*), sp.			*a*				324
Volutilithes, sp.							325
Turris? kaffraria (Griesb.)							325
Cancellaria meridionalis, Woods							326
,, sp.							327
Rostellites capensis, Woods							327
Actæon, sp.							328
Actæonella (*Trochactæon*), sp.						*a* L.Sen.	328
Eriptycha perampla, Woods							329
CEPHALOPODA.							
Nautilus, sp.							330
Phylloceras, sp.							331
,, sp.							332
Hamericeras Gardeni (Baily).....		?	×			*a* L.Camp.	332
,, *Rembda* (Forbes)				×		*a* U.Camp.	333
Pseudophyllites Indra (Forbes)				×	×	× U.Camp.	334
Tetragonites sp. [aff. *Cala*, Forbes] ..				*a*			335
Gaudryceras Kayei (Forbes)				×		*a* U.Camp.	335
Holcodiscus, sp.							336
Schlænbachia Umbulazi (Baily).....							336
Eulophoceras natalense, Hyatt							337
Mortoniceras Soutoni (Baily).....						*a* Sen.	337
,, *Stangeri* (Baily)							338
Heteroceras, sp.							339
,, sp.							339
Hamites (*Anisoceras*) *subcompressus*, Forbes				×			339
Hamites (*Anisoceras*) *indicus*, Forbes				×			340
,, ,, sp.							340
Baculites sulcatus, Baily							341
,, *Bailyi*, Woods.....							341
,, *capensis*, Woods						*a* L.Sen.	342
Scaphites, sp.							343